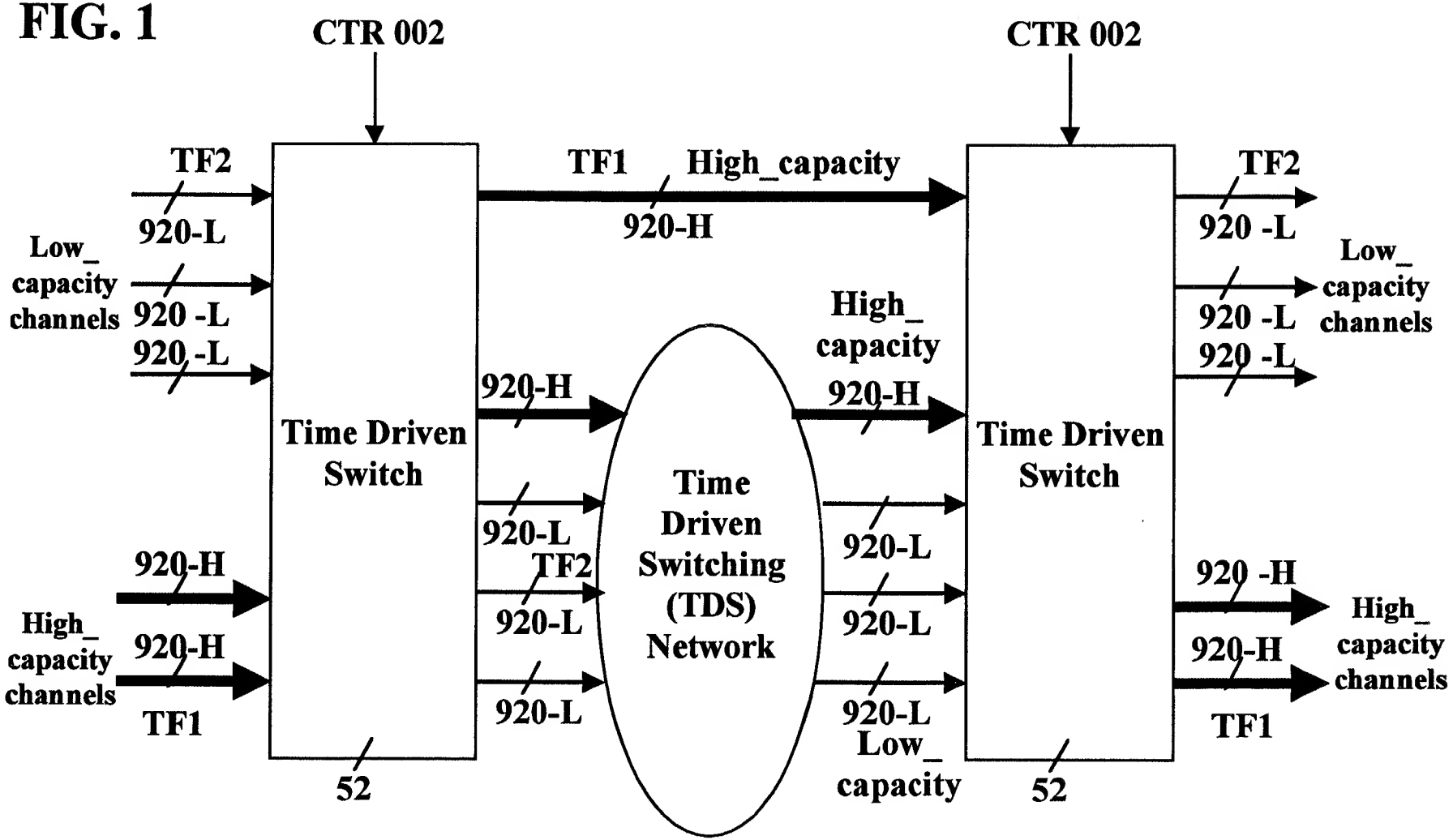
PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 1 OF 65

FIG. 1



c = High_capacity/Low_capacity

PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 2 OF 65

FIG. 2

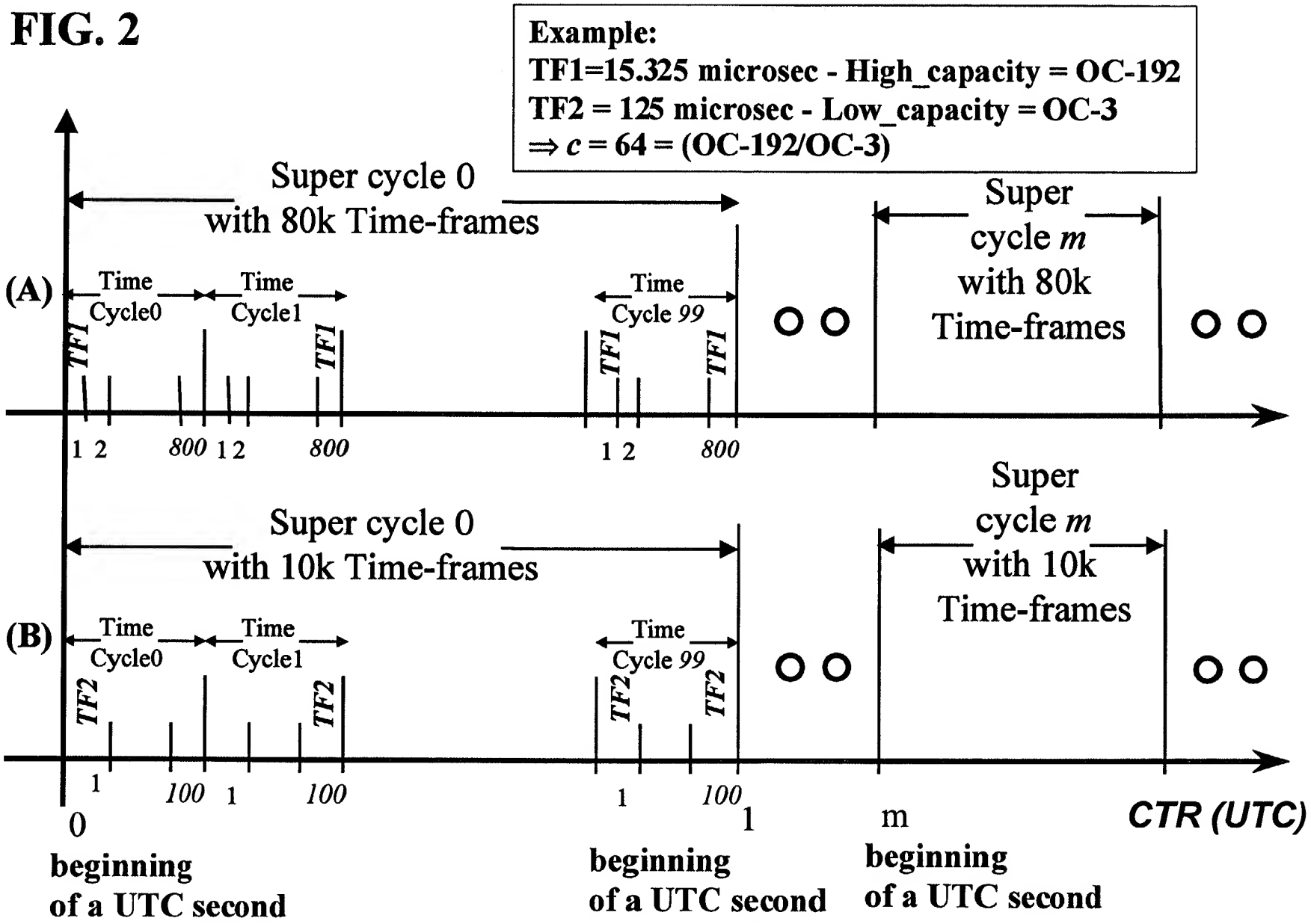
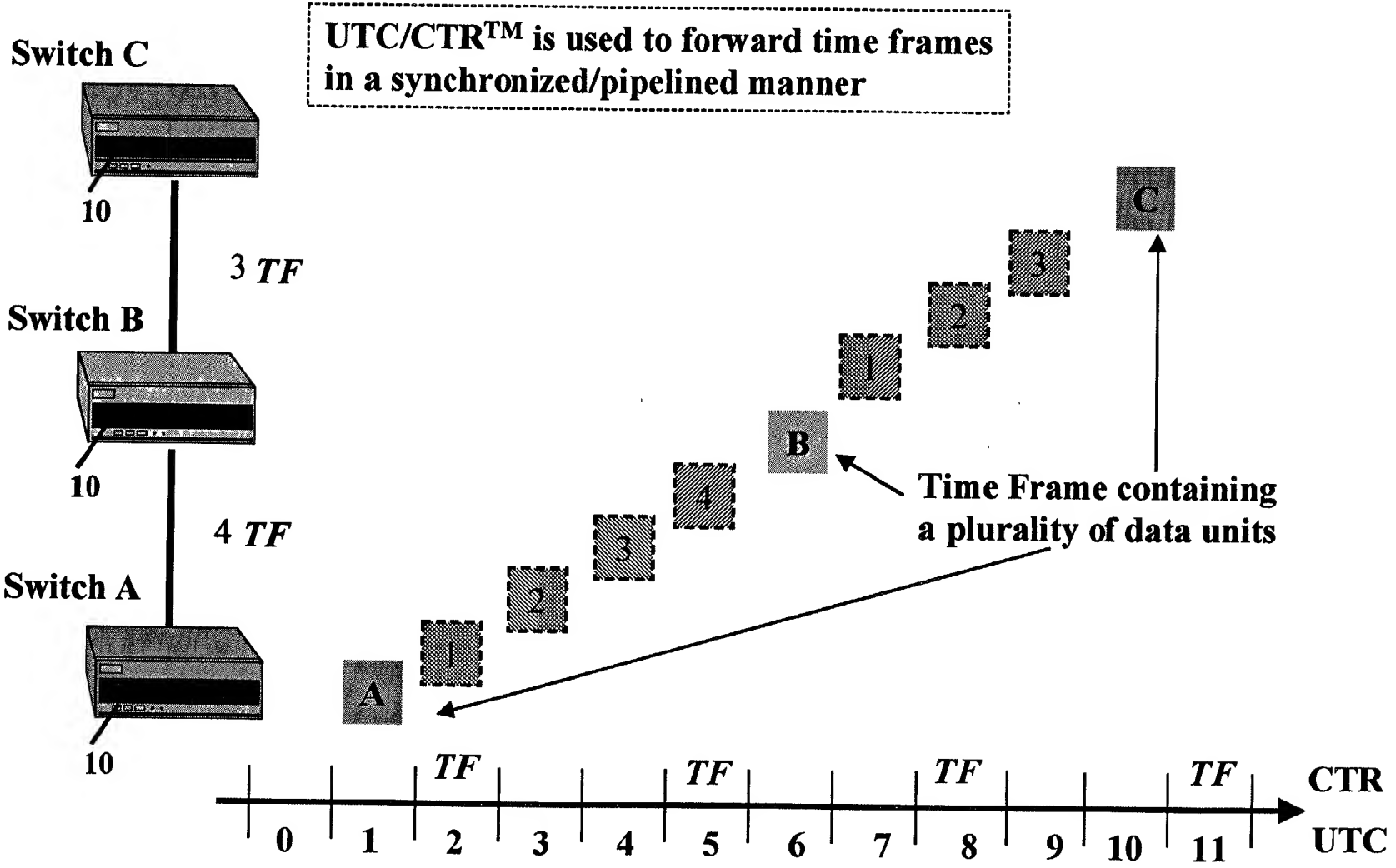


FIG. 3


UTC/CTR™ is used to forward time frames in a synchronized/pipelined manner
Switch C
Switch B
Switch A
10
10
10
3 TF
4 TF
A
1
2
3
4
B
1
2
3
C
Time Frame containing a plurality of data units
TF
TF
TF
TF
CTR
0
1
2
3
4
5
6
7
8
9
10
11
UTC

PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 4 OF 65

FIG. 4

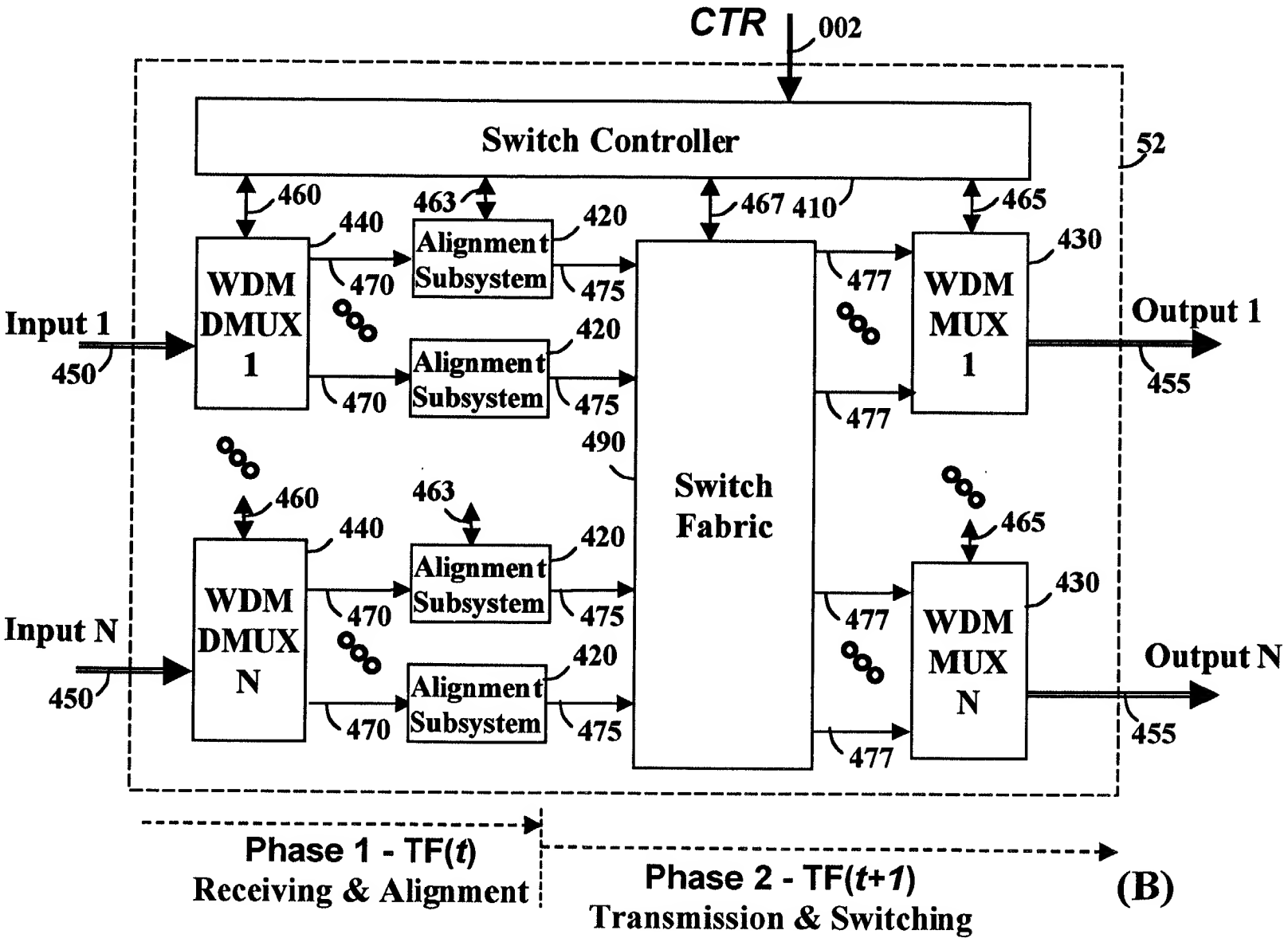


FIG. 5

Two time intervals: SC1_length·TF1 = 1 UTC second

- SC2_length·TF2 = 1 UTC second
- TF2 = (SC1_length / SC2_length) · TF1 = k · TF1, where the time cycles of TF1 and TF2 are aligned with respect to UTC.

For ***k*** = 2 and ***c*** = 4 (e.g., High_capacity=OC-192, Low_capacity=OC-48):

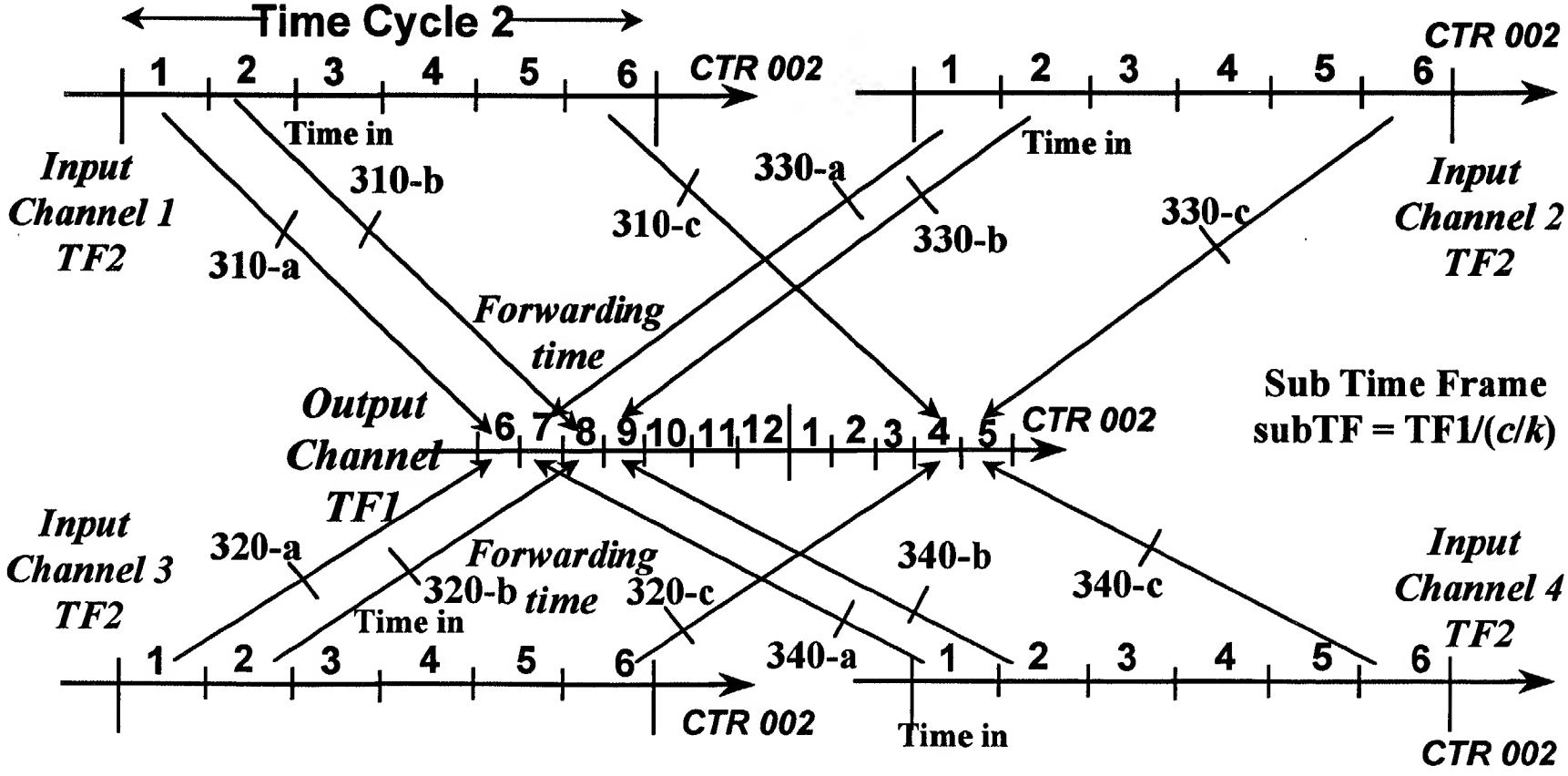


FIG. 6

Two time intervals: ***SC1_length·TF1 = 1*** **UTC second**

- ***SC2_length·TF2 = 1*** **UTC second**
- ***TF2 = (SC1_length / SC2_length) · TF1 = k · TF1***, where the time cycles of ***TF1*** and ***TF2*** are aligned with respect to UTC.

For ***k*** = 2 and ***c*** = 4 (e.g., High_capacity=OC-192, Low_capacity=OC-48):

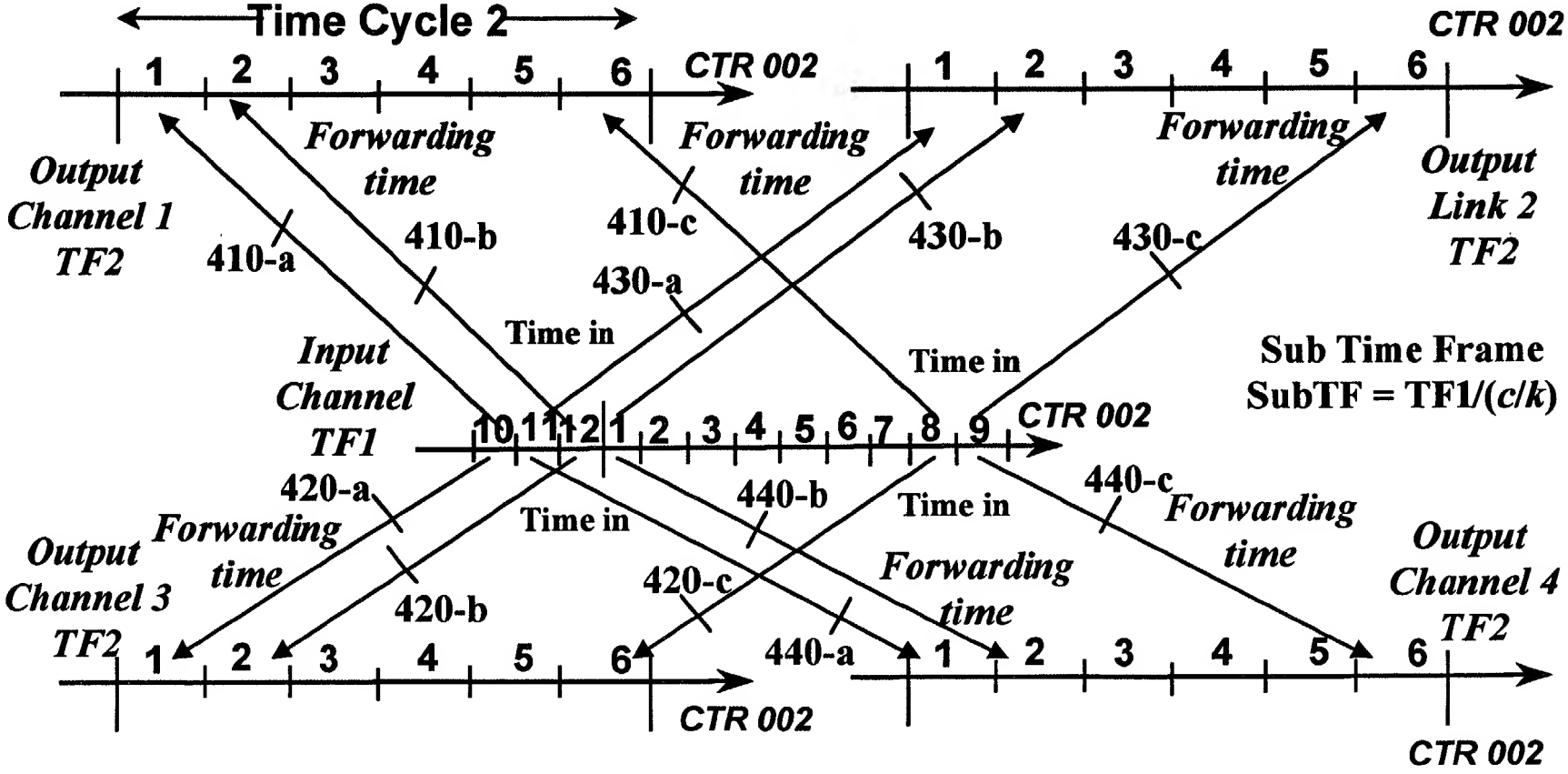


FIG. 7

Two time intervals: *SC1_length·TF1 = 1* UTC second

- ***SC2_length·TF2 = 1*** **UTC second**
- ***TF2 = (SC1_length / SC2_length) · TF1 = k · TF1*****, where the time cycles of *TF1* and *TF2* are aligned with respect to UTC.**
  For *k* = 2 and *c* = 4 (e.g., High_capacity=OC-192, Low_capacity=OC-48):

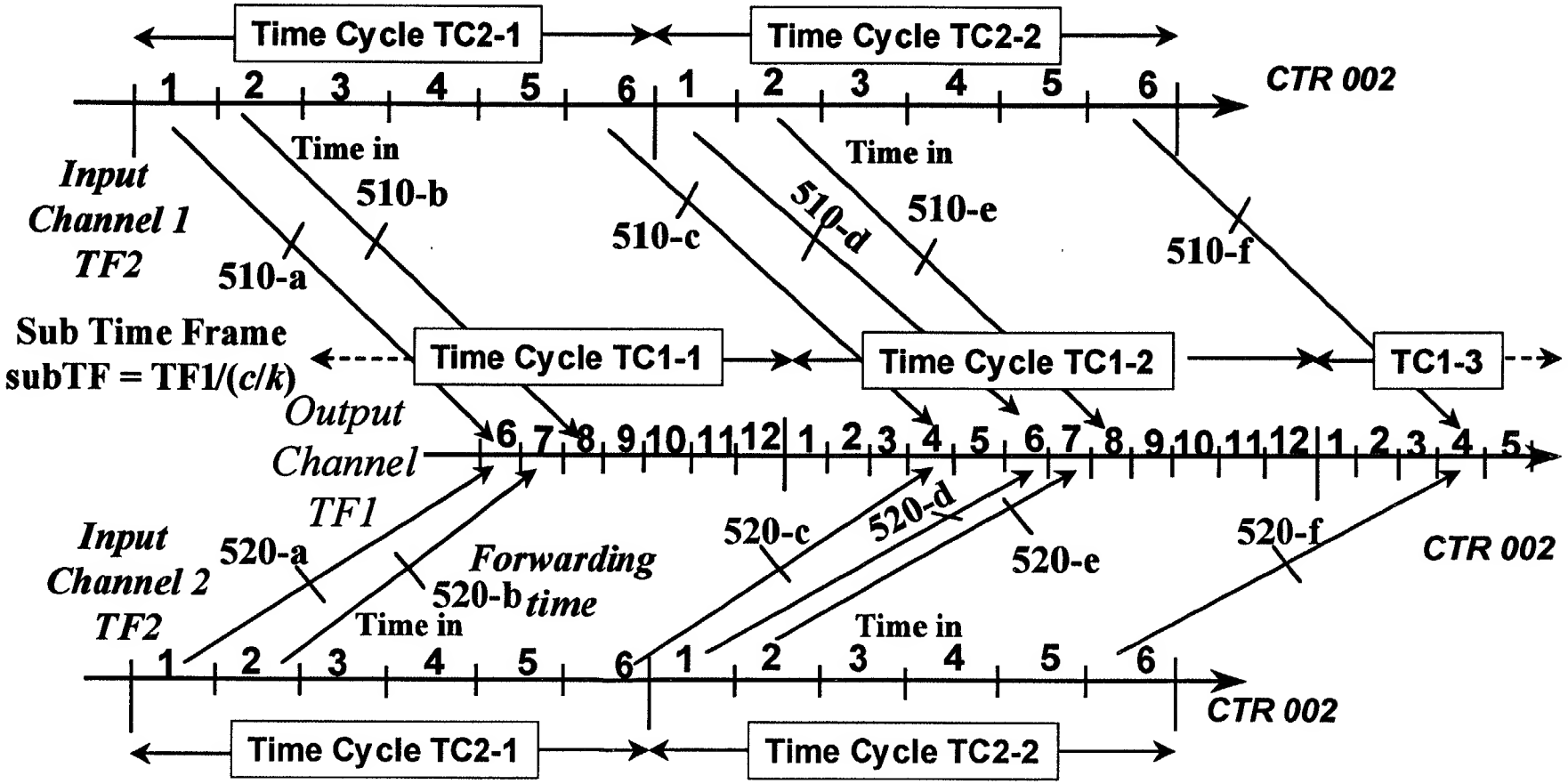


FIG. 8

Two time intervals: *SC1_length·TF1 = 1* UTC second

- *SC2_length·TF2 = 1* UTC second
- *TF2 = (SC1_length / SC2_length) · TF1 = k · TF1*, where the time cycles of *TF1* and *TF2* are aligned with respect to UTC.

For $k = 2$ and $c = 4$ (e.g., High_capacity=OC-192, Low_capacity=OC-48):

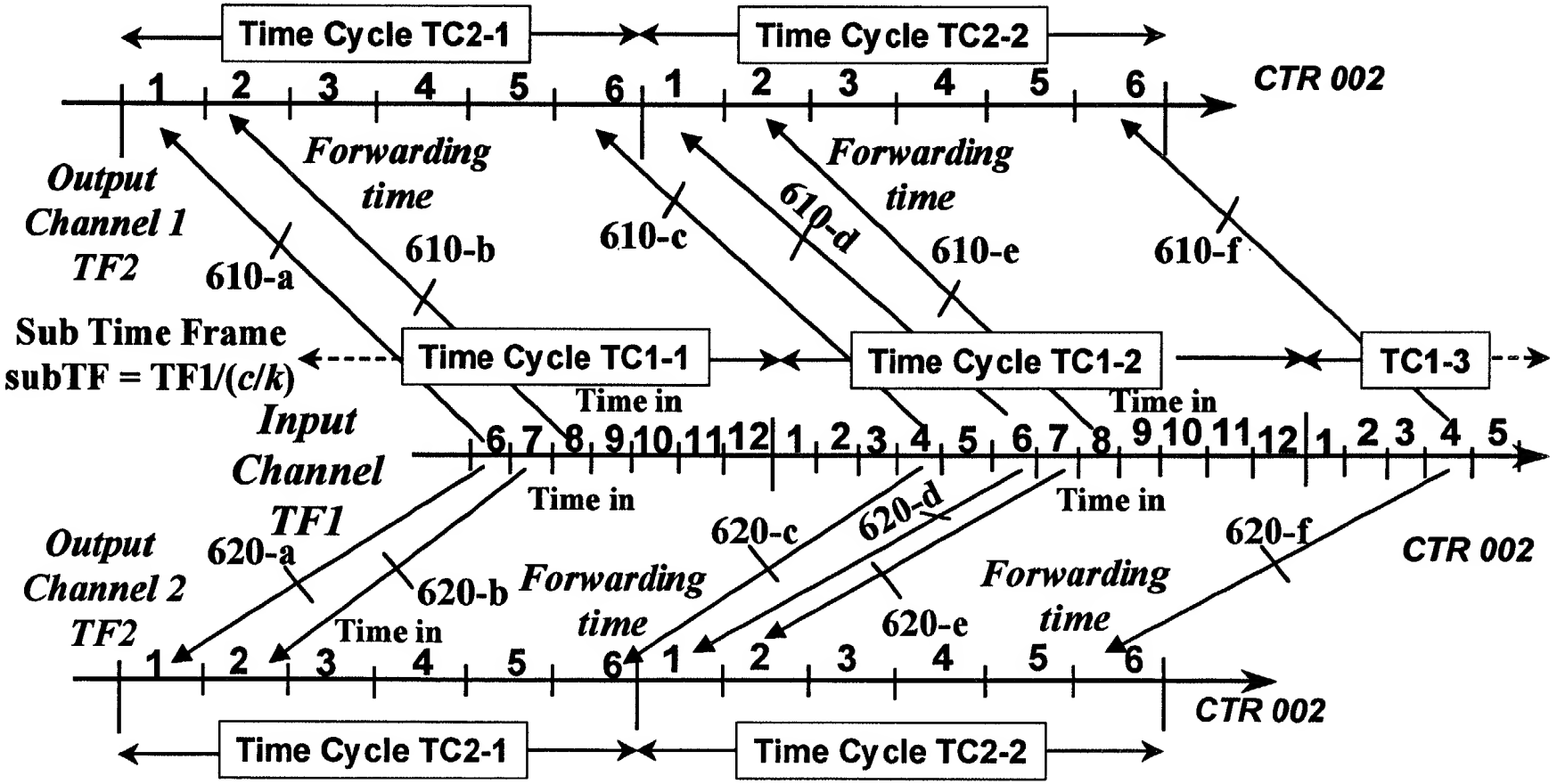


FIG. 9

c=4, e.g., OC-192/OC-48
k=2, e.g., 25 microsec/12.5 microsec

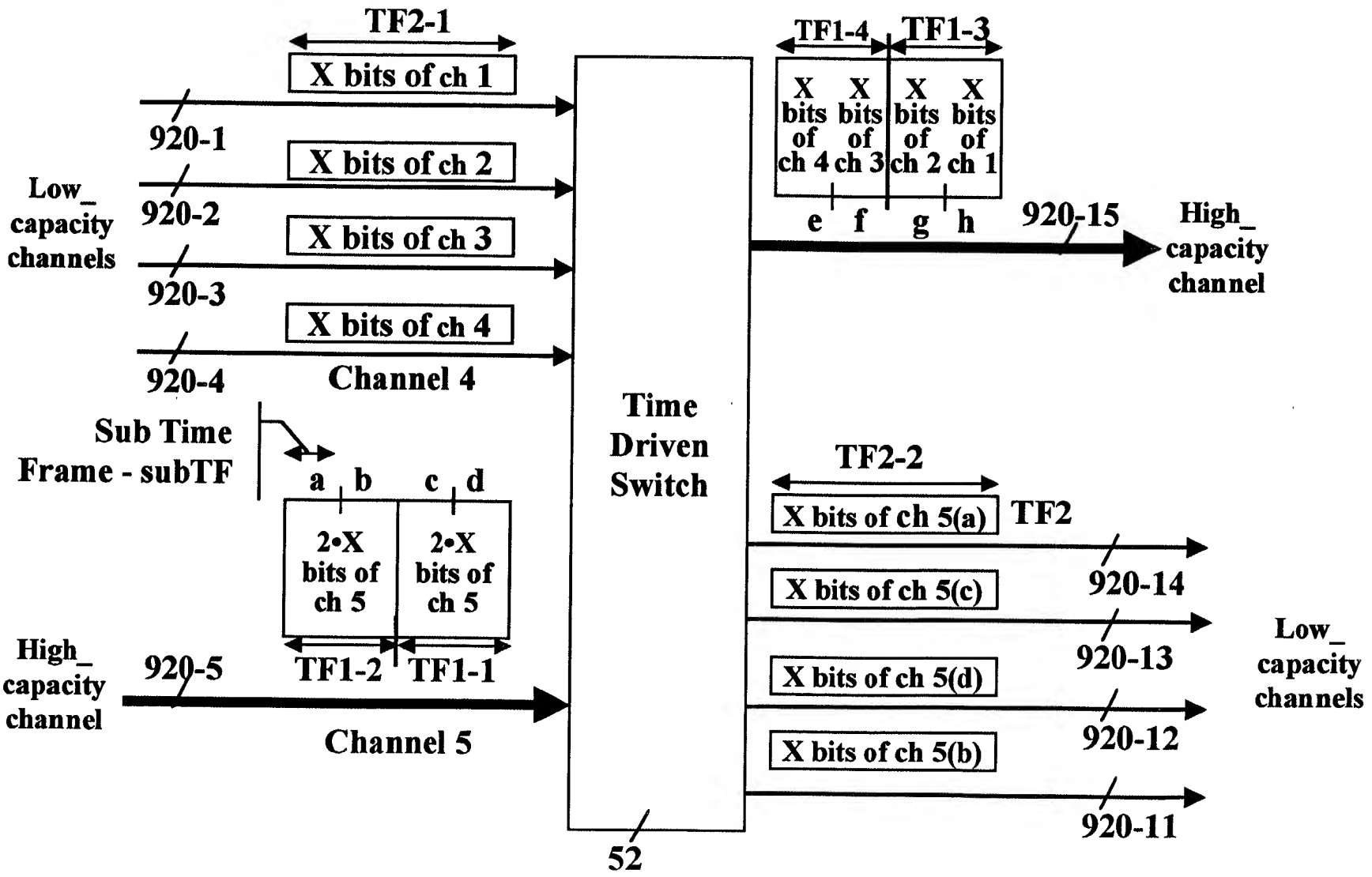
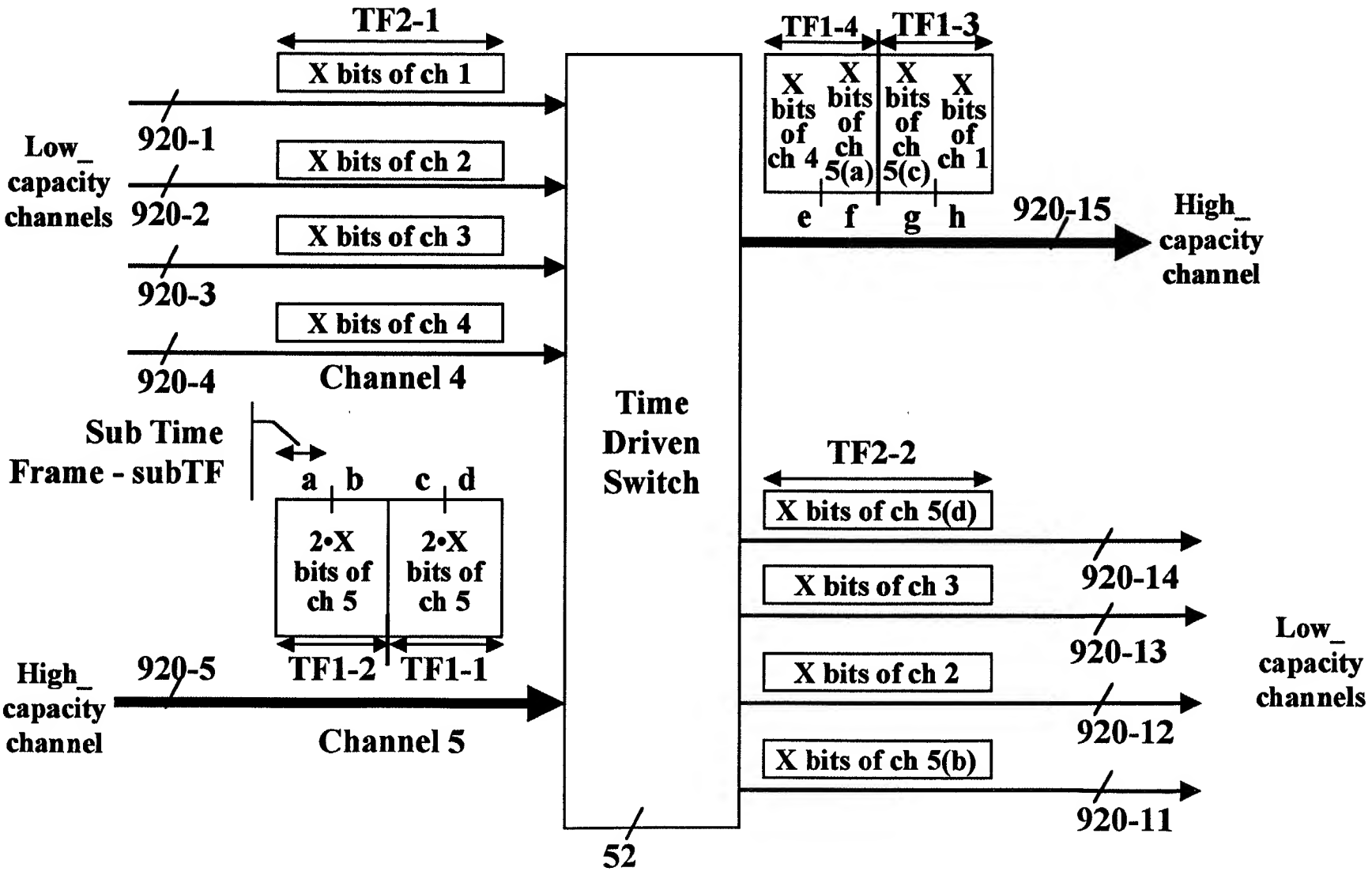


FIG. 10

c=4, e.g., OC-192/OC-48
k=2, e.g., 25 microsec/12.5 microsec



PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 11 OF 65

FIG. 11

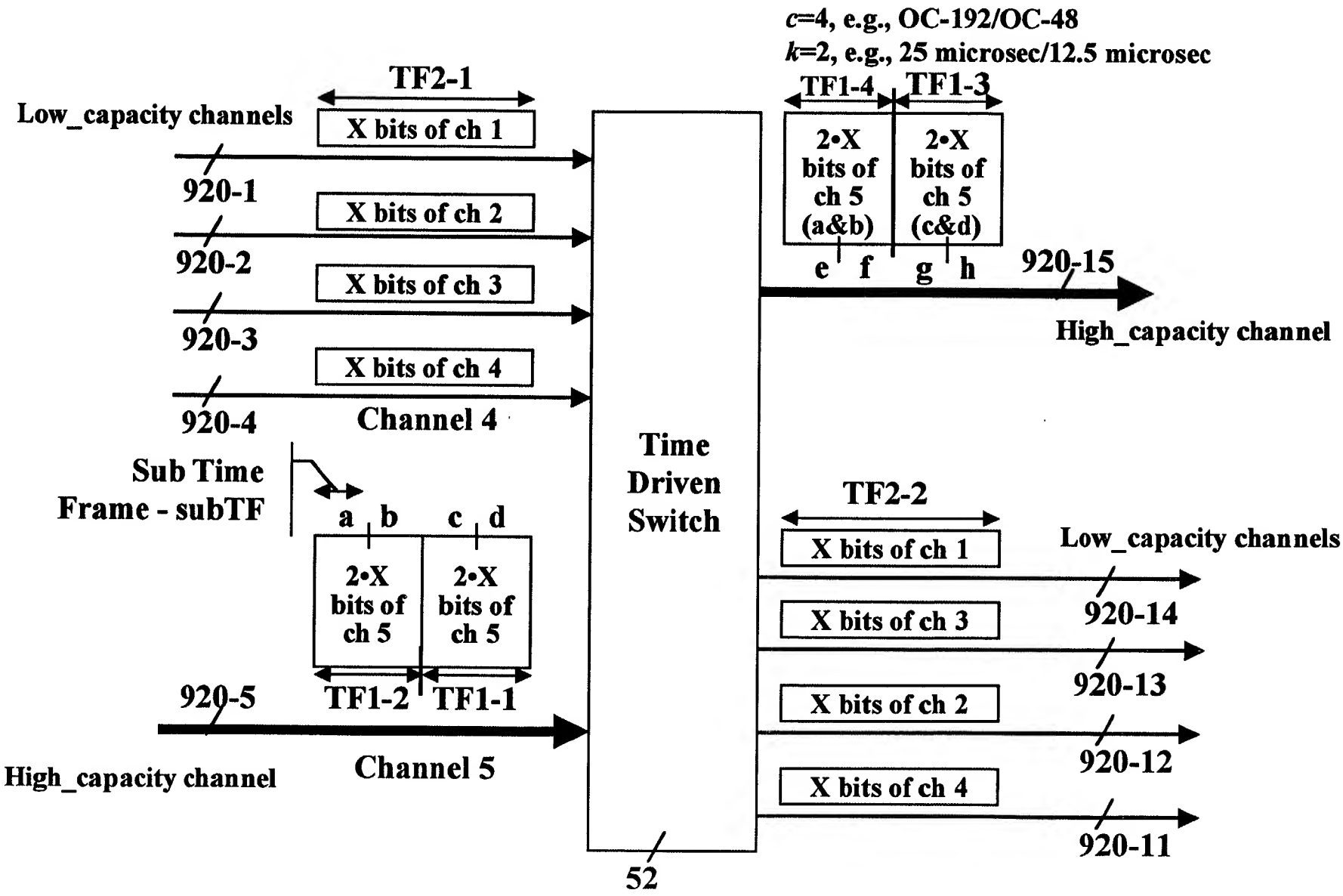
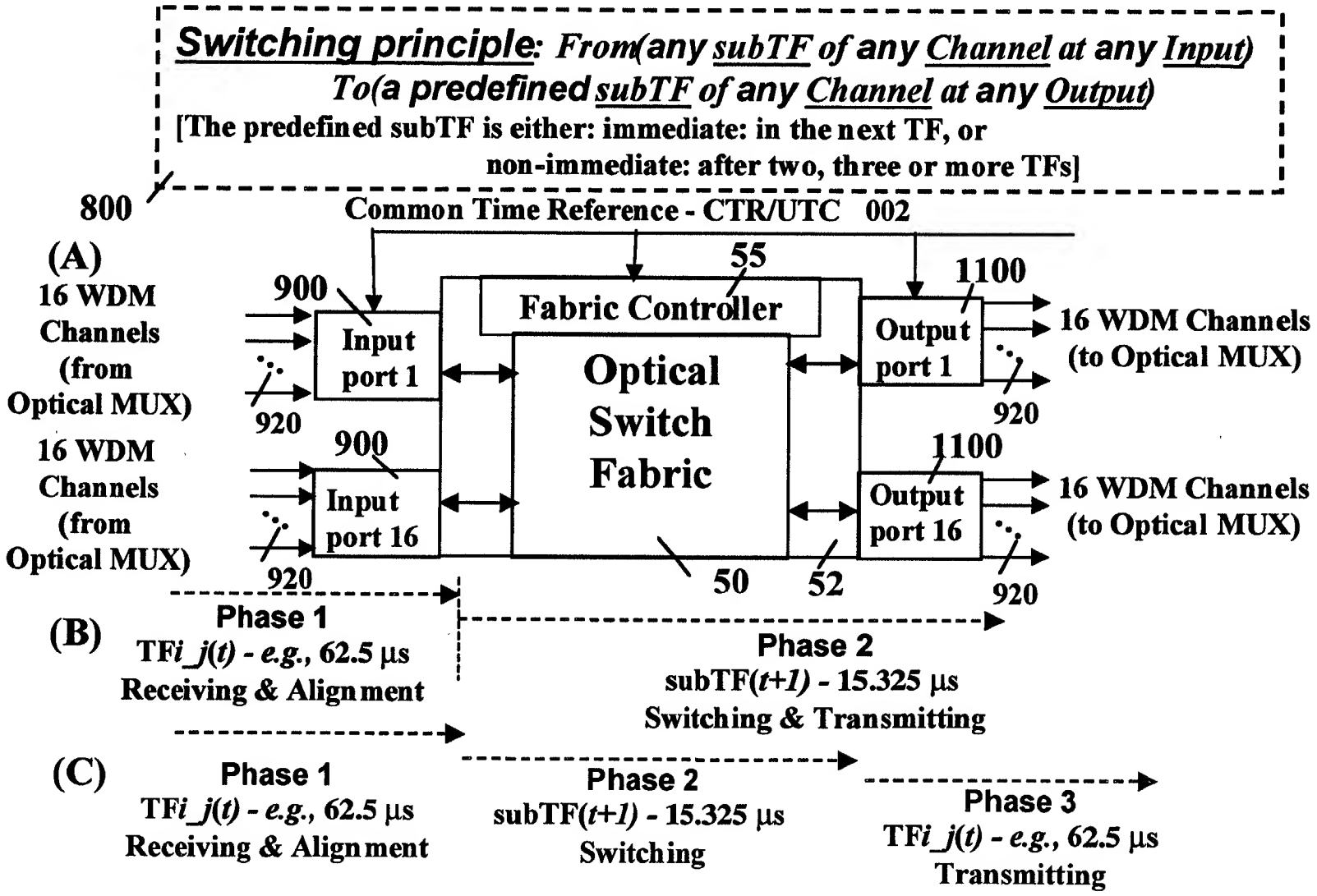


FIG. 12



PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 12 OF 65

FIG. 13

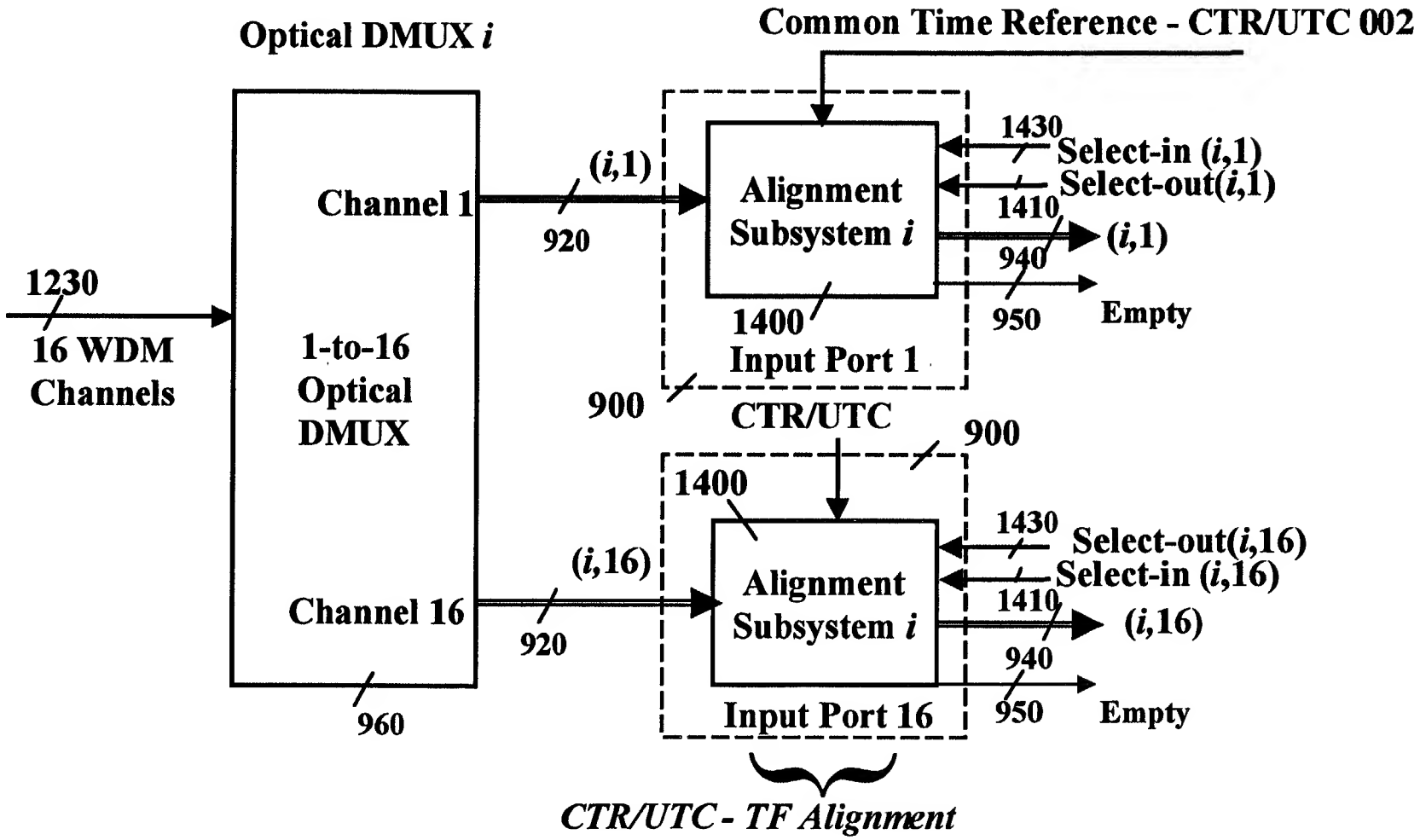
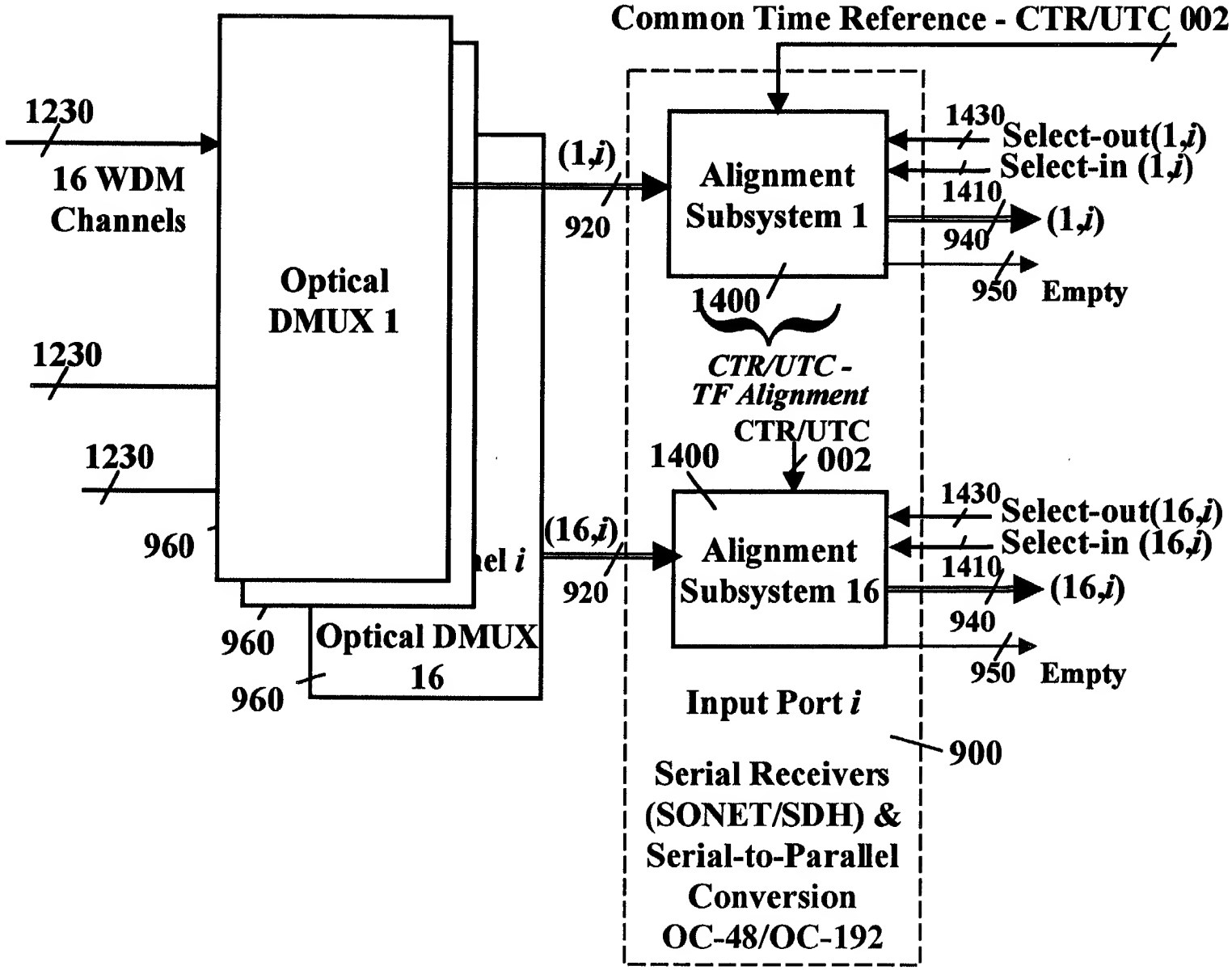
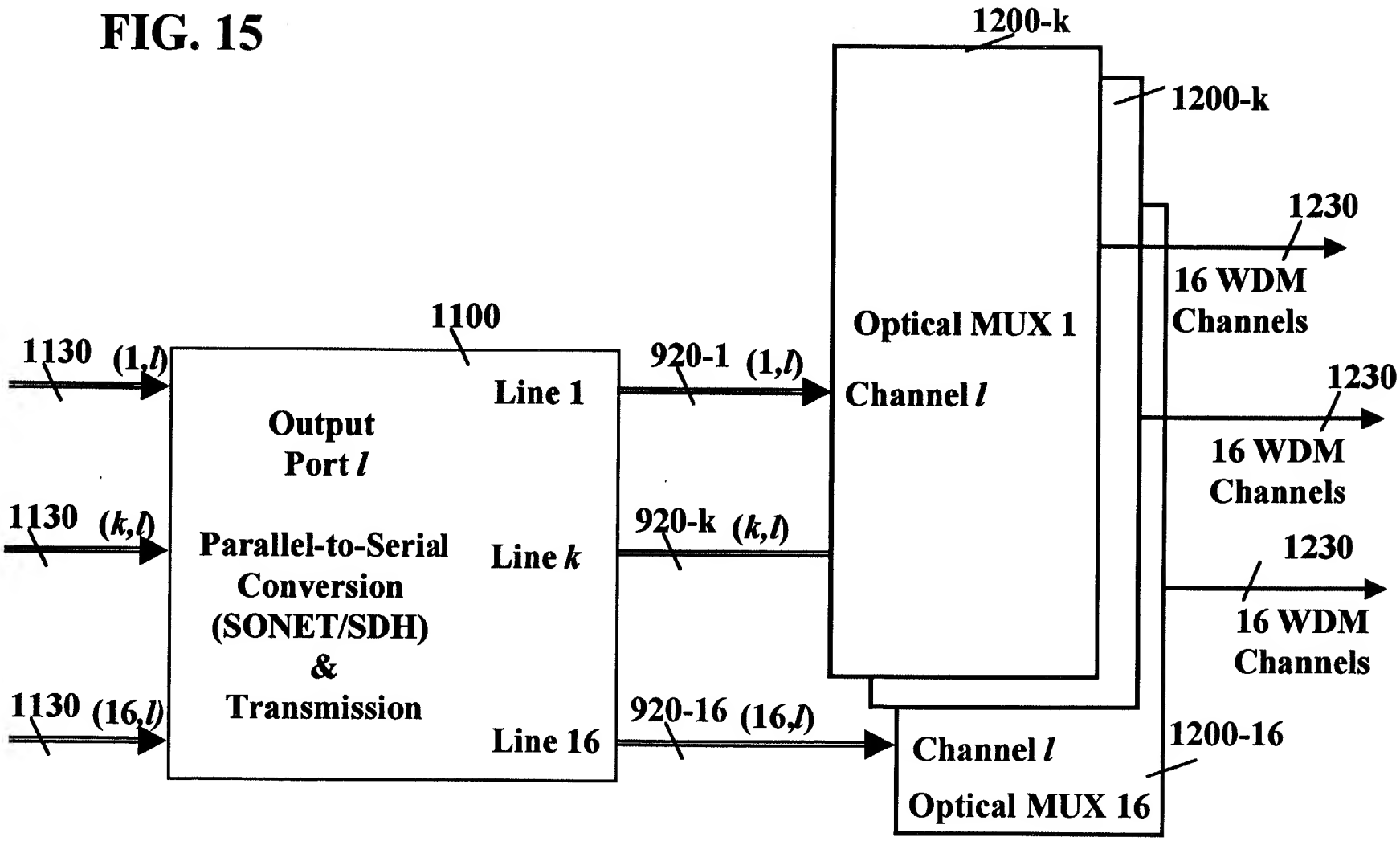

Optical DMUX *i*
Common Time Reference - CTR/UTC 002
1230
16 WDM Channels
1-to-16 Optical DMUX
Channel 1
Channel 16
960
(*i*,1)
920
(*i*,16)
920
Alignment Subsystem *i*
1400
Input Port 1
900
CTR/UTC
1430
Select-in (*i*,1)
Select-out(*i*,1)
1410
(*i*,1)
940
950
Empty
Alignment Subsystem *i*
1400
Input Port 16
900
1430
Select-out(*i*,16)
Select-in (*i*,16)
1410
(*i*,16)
940
950
Empty
CTR/UTC - TF Alignment

FIG. 14


Common Time Reference - CTR/UTC 002
1230
16 WDM Channels
Optical DMUX 1
1230
1230
960
960
960
Optical DMUX 16
(1,i)
920
(16,i)
920
Alignment Subsystem 1
Alignment Subsystem 16
1400
1400
CTR/UTC - TF Alignment
CTR/UTC 002
1430
Select-out(1,i)
Select-in (1,i)
1410
(1,i)
940
950
Empty
1430
Select-out(16,i)
Select-in (16,i)
1410
(16,i)
940
950
Empty
Input Port i
900
Serial Receivers (SONET/SDH) & Serial-to-Parallel Conversion OC-48/OC-192

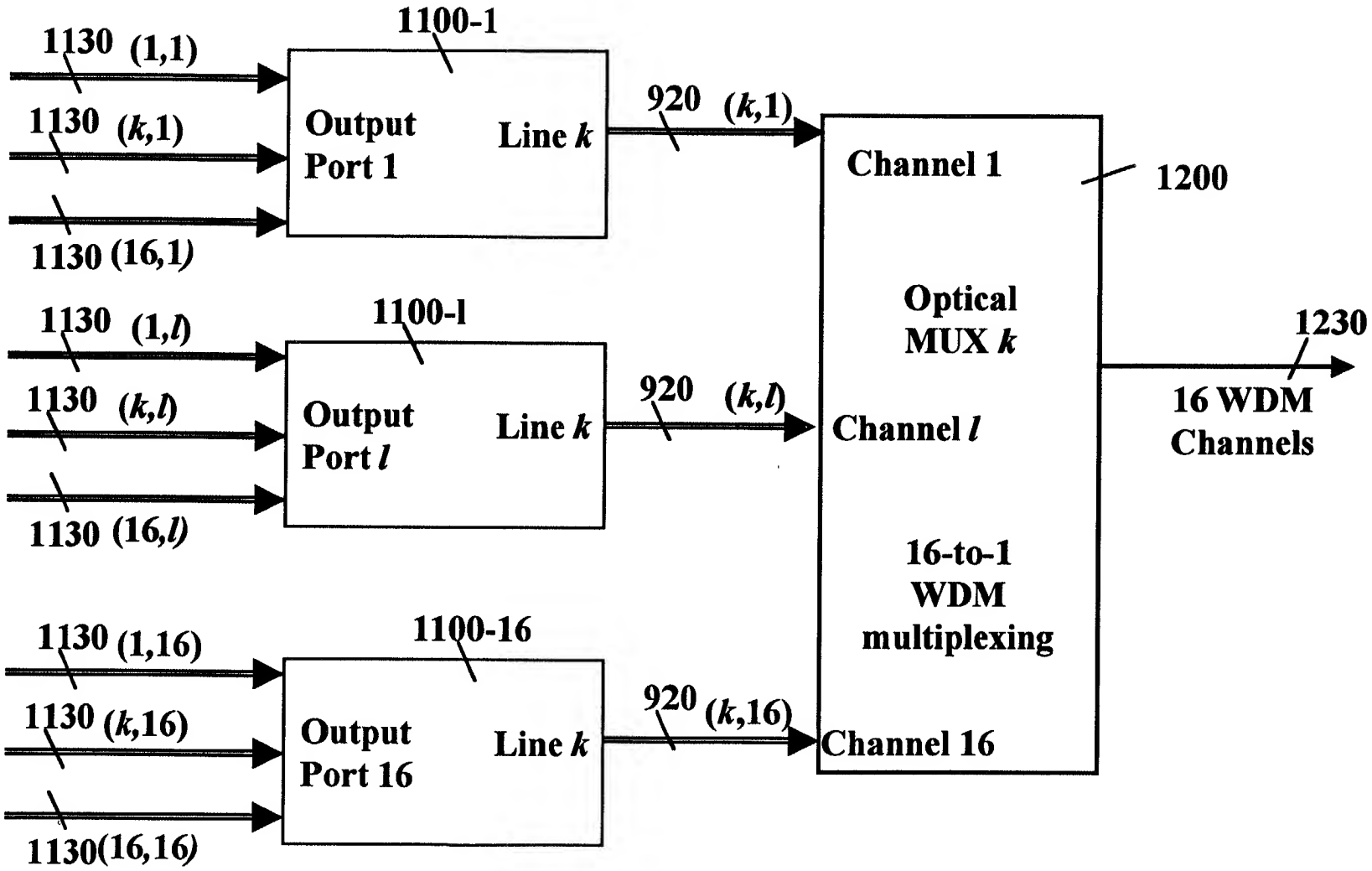
PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 15 OF 65

FIG. 15



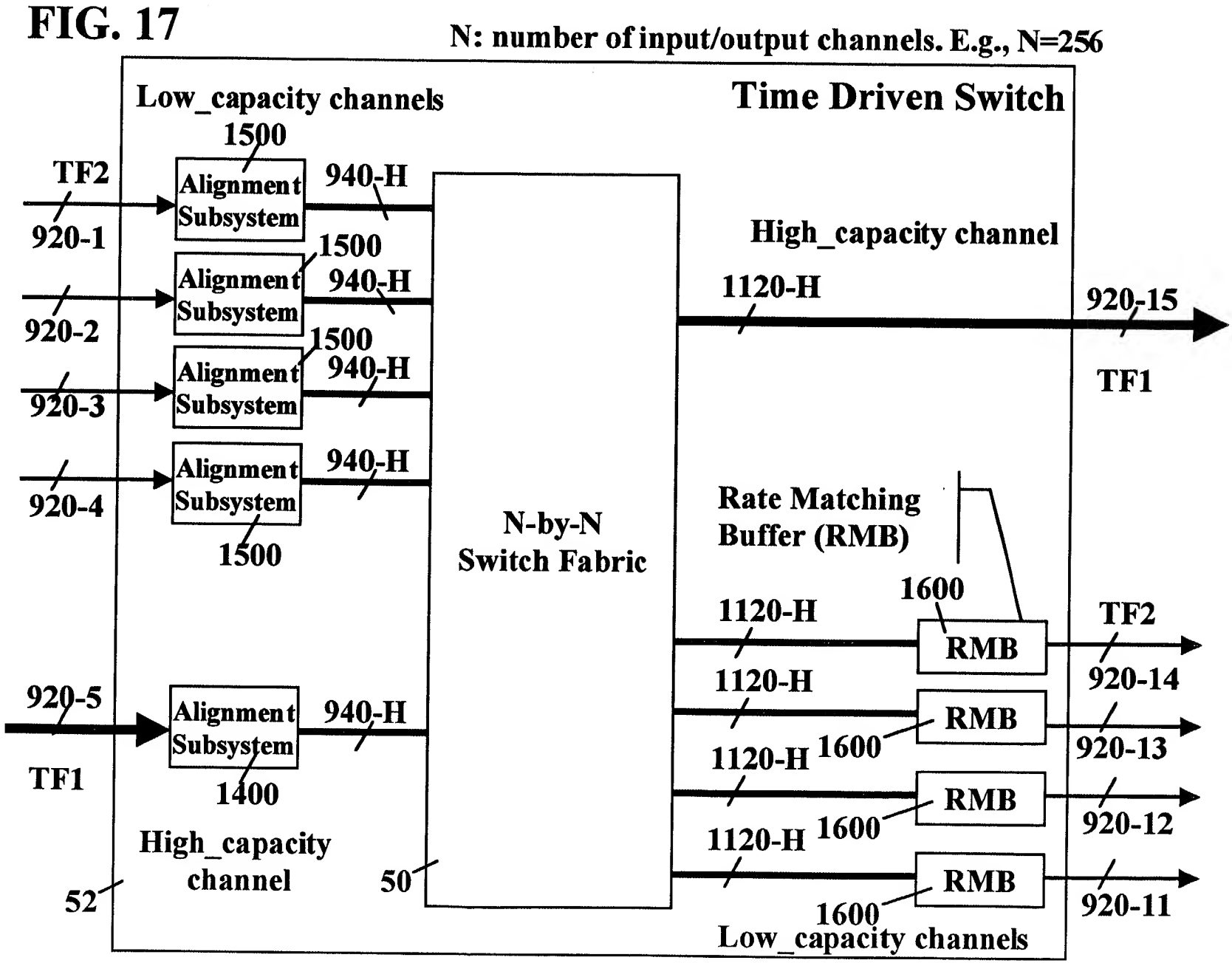
PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 16 OF 65

FIG. 16



PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 17 OF 65

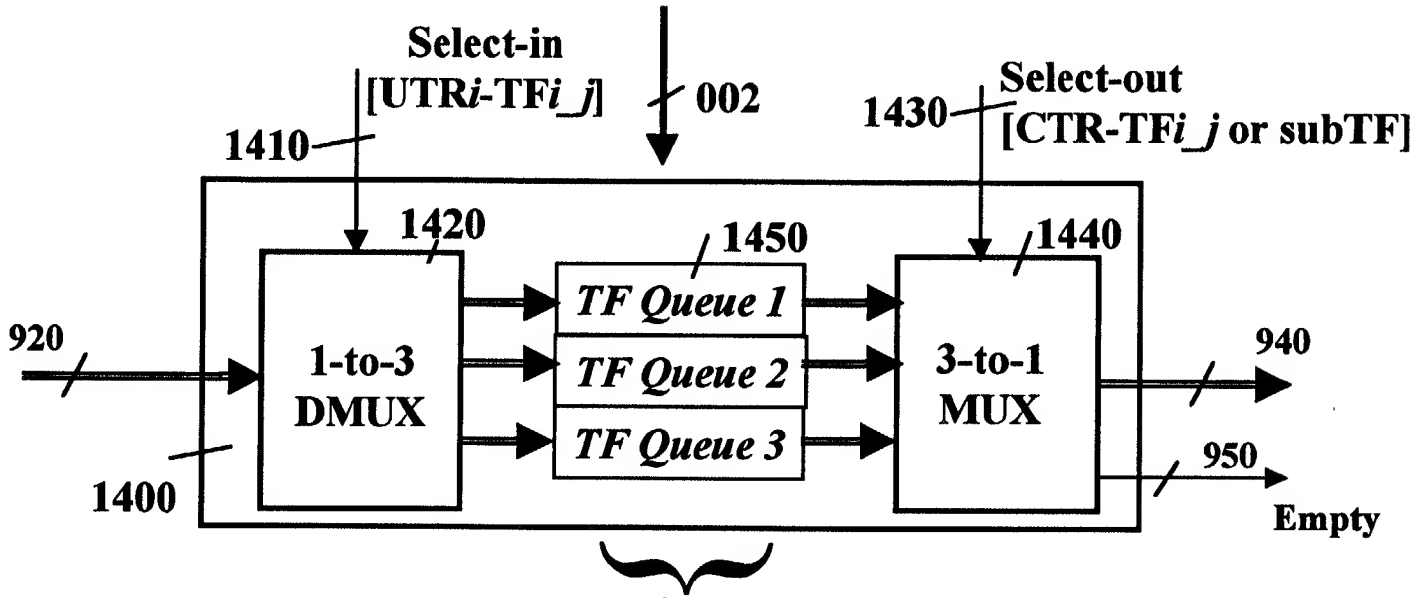
FIG. 17



PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 18 OF 65

FIG. 18

TF*i_j*: Time frame duration on channel *j* at Input Interface *i*.
UTR*i*: UTR on link connected to Input Interface *i*
Common Time Reference - CTR/UTC

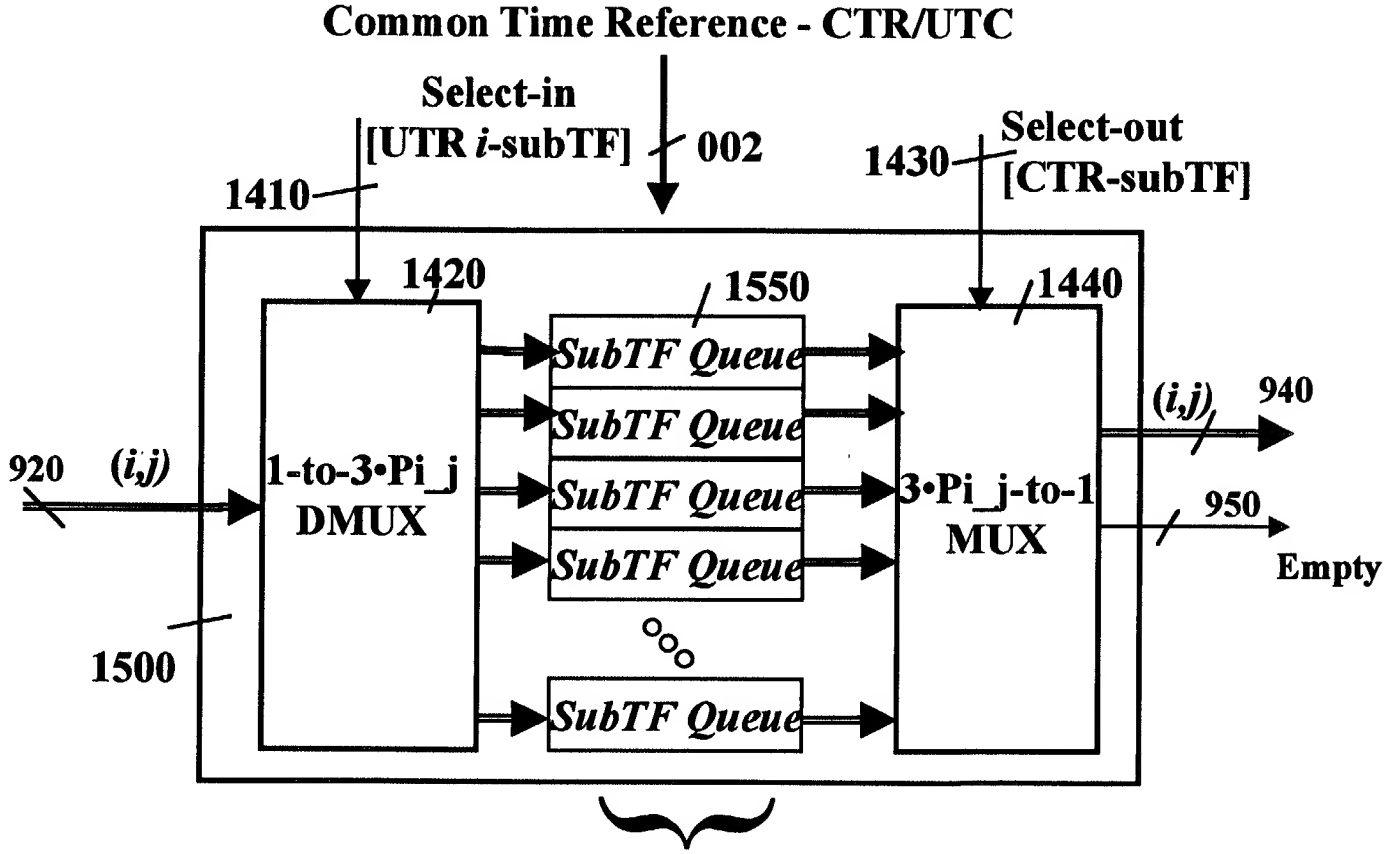


Alignment Subsystem for Channel *j* at Input Interface *i*
with a Plurality of Time Frame Queues

PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 19 OF 65

FIG. 19

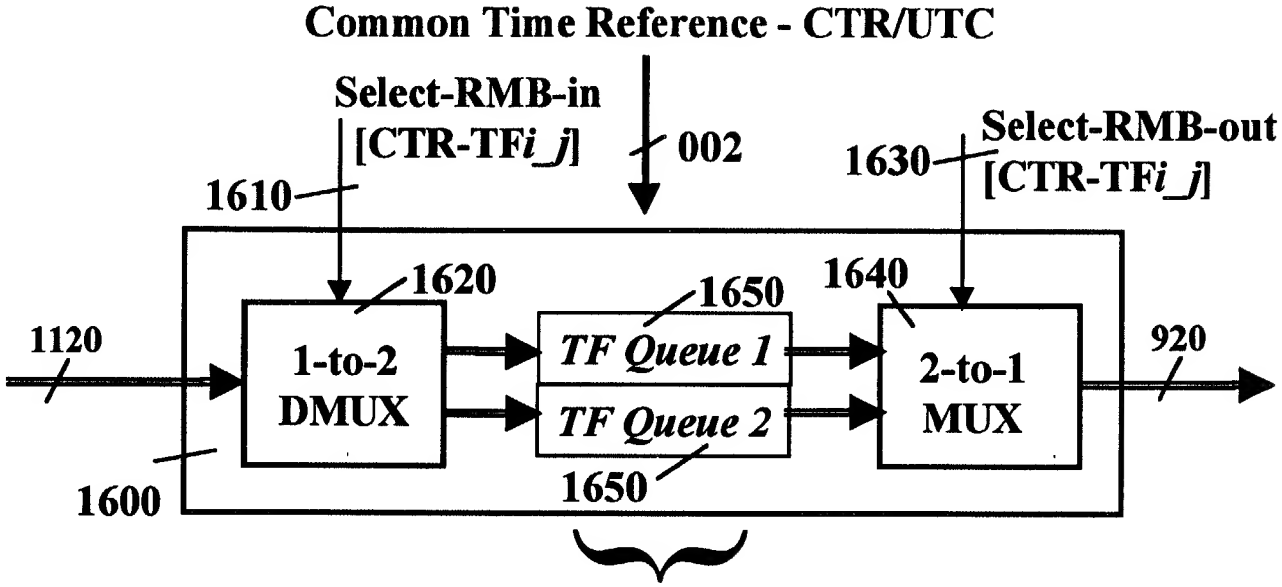
TF*i_j*: Time frame duration on channel *j* at Input Interface *i*.
UTR *i*: UTR on link connected to Input Interface *i*
P*i_j* = TF*i_j*/subTF



Alignment Subsystem for *high capacity* Channel *j* at Input Interface *i*
with a Plurality of <u>Sub-Time Frame Queues</u>

PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 20 OF 65

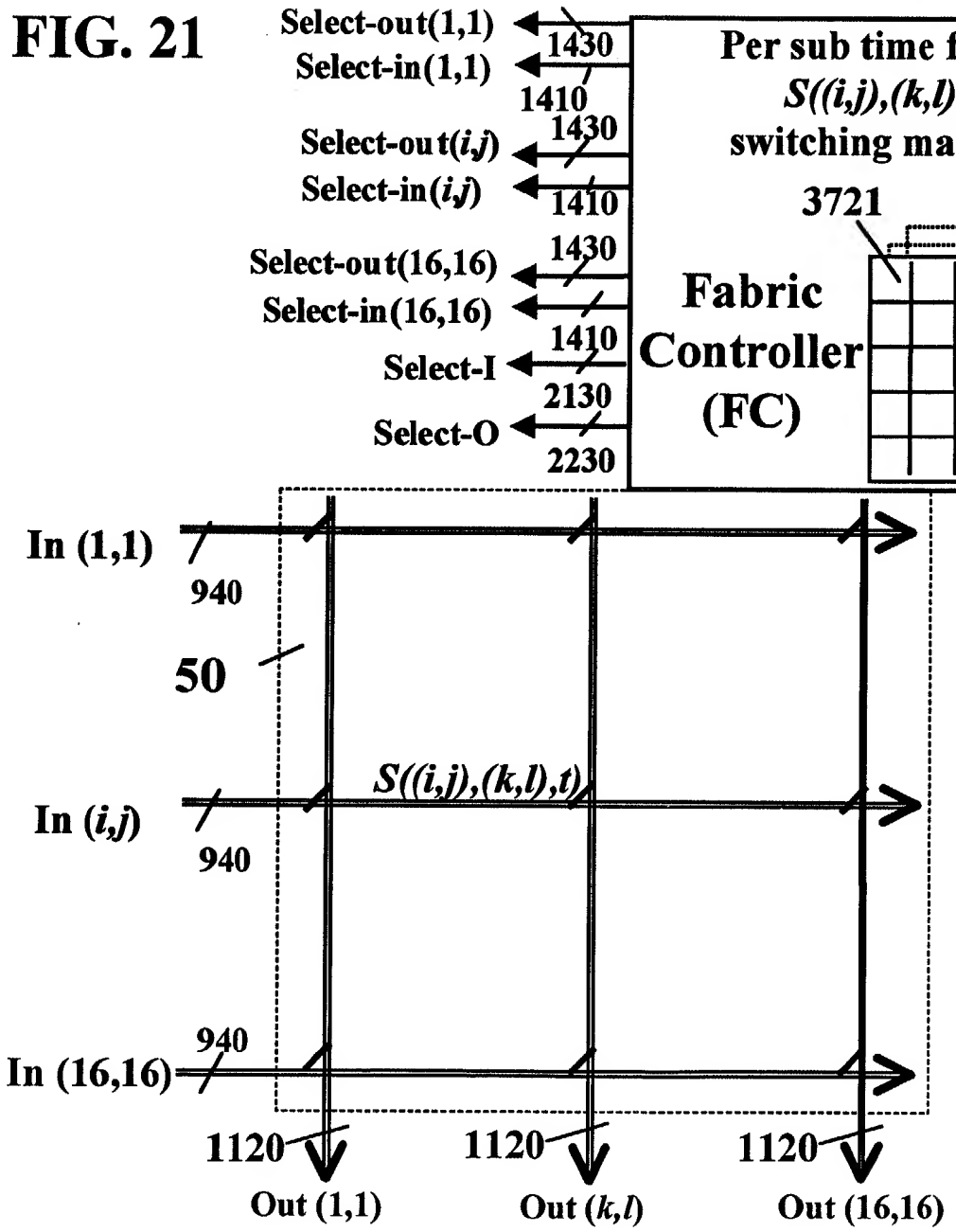
FIG. 18+2 **TF*i_j*: Time frame duration on channel *j* at Input Interface *i*.**
UTR*i*: UTR on link connected to Input Interface *i*



Rate Matching Buffer for Channel *j* at Output Interface *i*
with a Plurality of Time Frame Queues
(Also single buffer with dual access memory with single phase switching and forwarding)

PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 21 OF 65

FIG. 21



Fabric controller (FC):

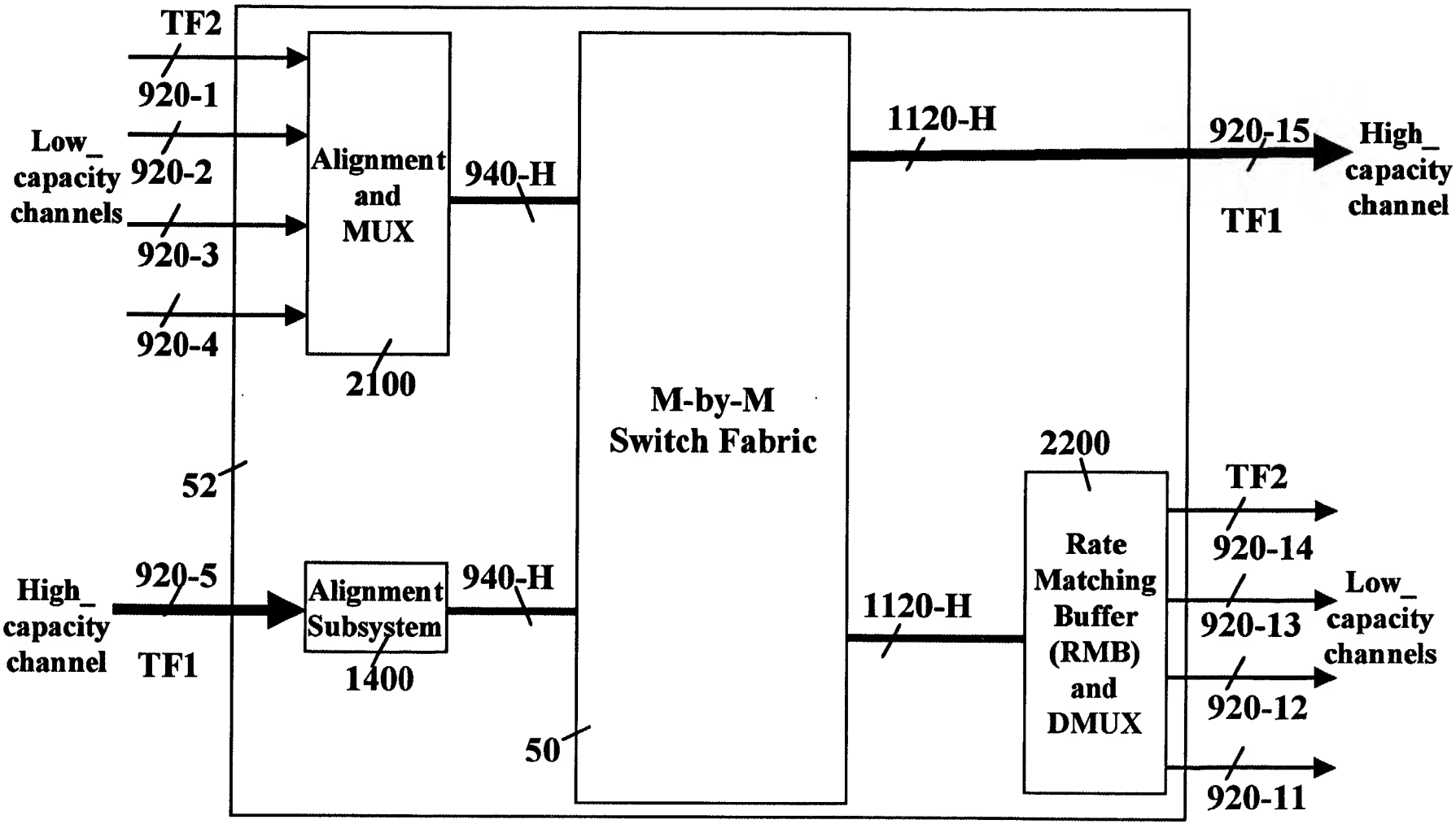
S ((i,j),(k,l),t) **- switching matrix for every sub-time frame in each time cycle and super cycle.**

The matrix defines which input channel *i,j* should be connected to output channel *k,l* - in sub time frame *t*, where *S((i,j),(k,l),t)=1:*

1. **At every sub-time frame an input channel can be connected to one or more output optical channels (multicast - MCST)**
2. **At every sub-time frame an output optical channel can be connected to at most one input optical channel**

FIG. 22

N: number of input/output channels. E.g., N=256
M • High_capacity = N_high • High_capacity + N_low • Low_capacity
M<N



Time Driven Switch

FIG. 23

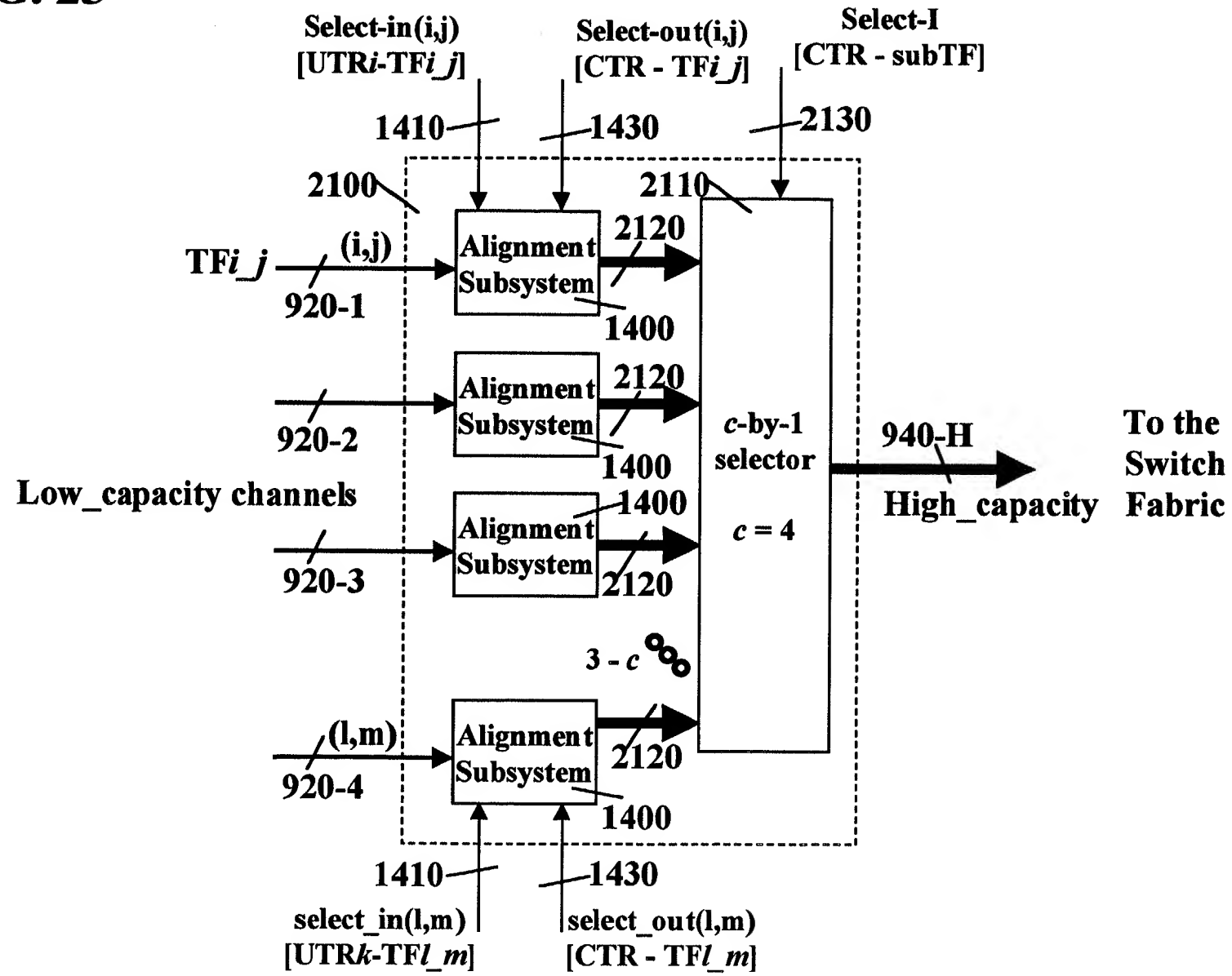
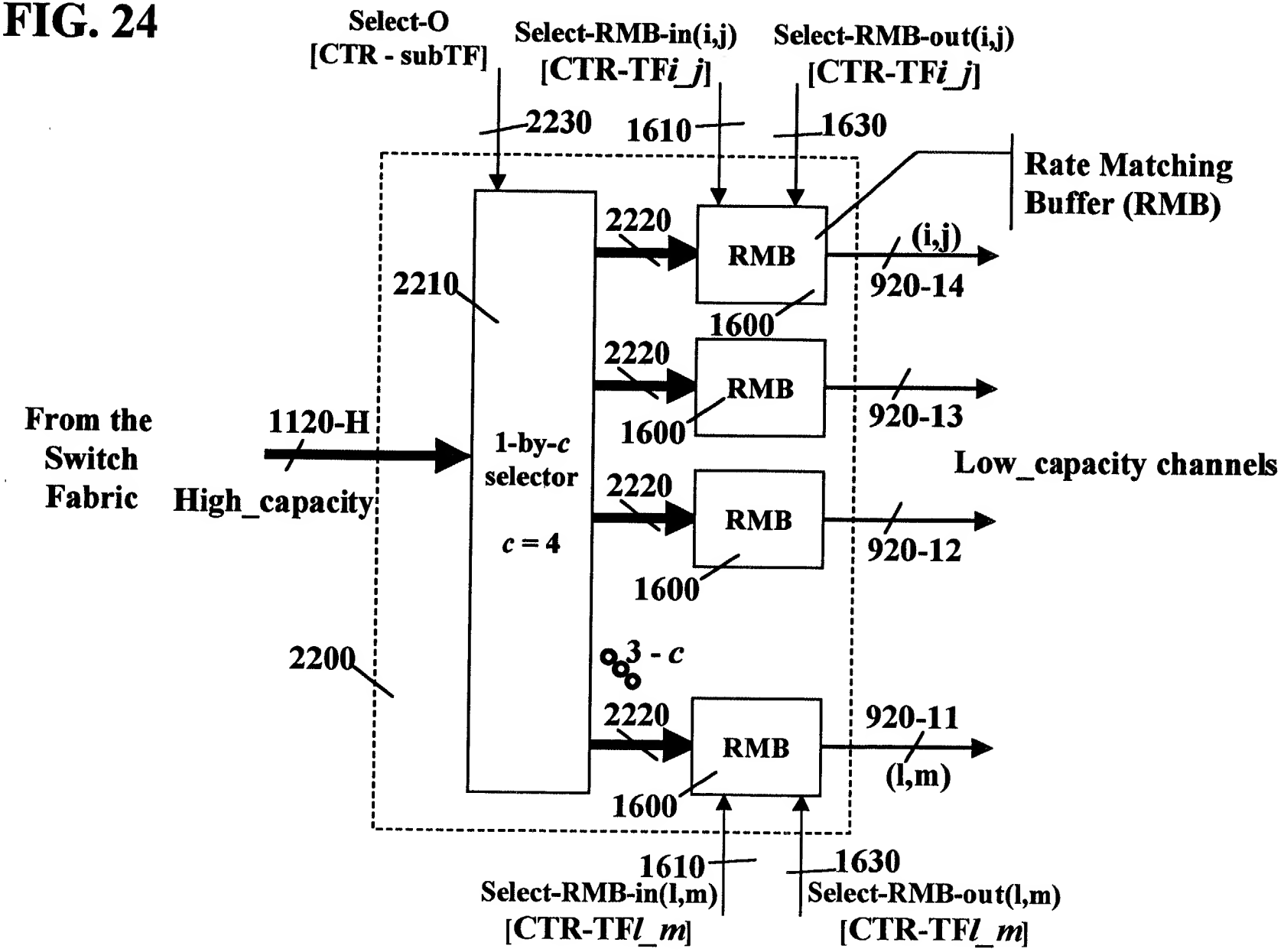

Select-in(i,j)
[UTRi-TFi_j]
Select-out(i,j)
[CTR - TFi_j]
Select-I
[CTR - subTF]
1410
1430
2130
2100
2110
TFi_j
(i,j)
920-1
Alignment Subsystem
2120
1400
920-2
Low_capacity channels
920-3
c-by-1 selector
c = 4
940-H
High_capacity
To the Switch Fabric
3 - c
(l,m)
920-4
select_in(l,m)
[UTRk-TFl_m]
select_out(l,m)
[CTR - TFl_m]

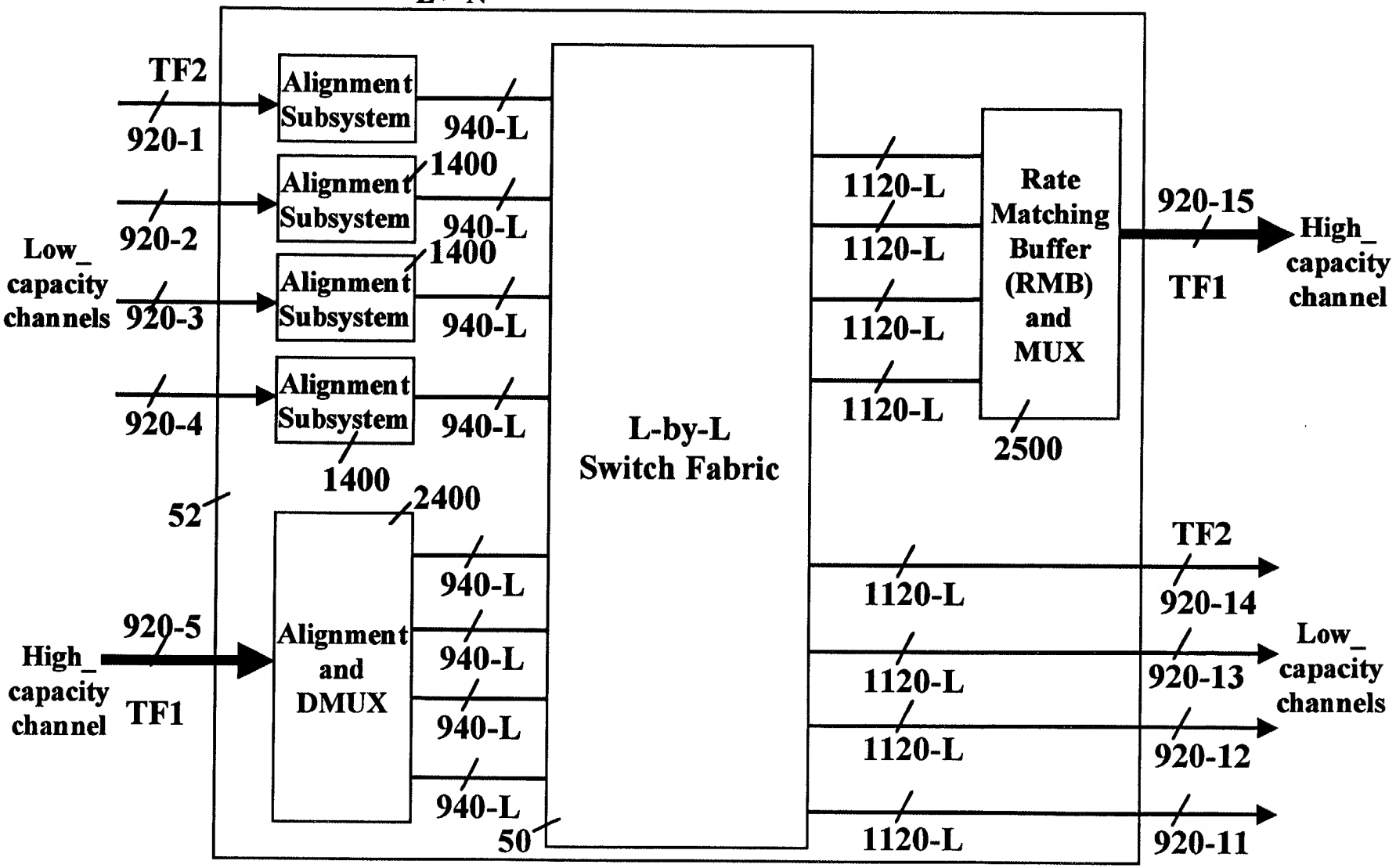
FIG. 24


Select-O
[CTR - subTF]
Select-RMB-in(i,j)
[CTR-TFi_j]
Select-RMB-out(i,j)
[CTR-TFi_j]
2230
1610
1630
Rate Matching
Buffer (RMB)
2220
RMB
(i,j)
920-14
2210
1600
2220
RMB
920-13
From the
Switch
Fabric
1120-H
1-by-c
selector
c = 4
High_capacity
Low_capacity channels
2220
RMB
920-12
1600
2200
3 - c
2220
RMB
920-11
(l,m)
1600
1610
Select-RMB-in(l,m)
[CTR-TFl_m]
1630
Select-RMB-out(l,m)
[CTR-TFl_m]

PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 25 OF 65

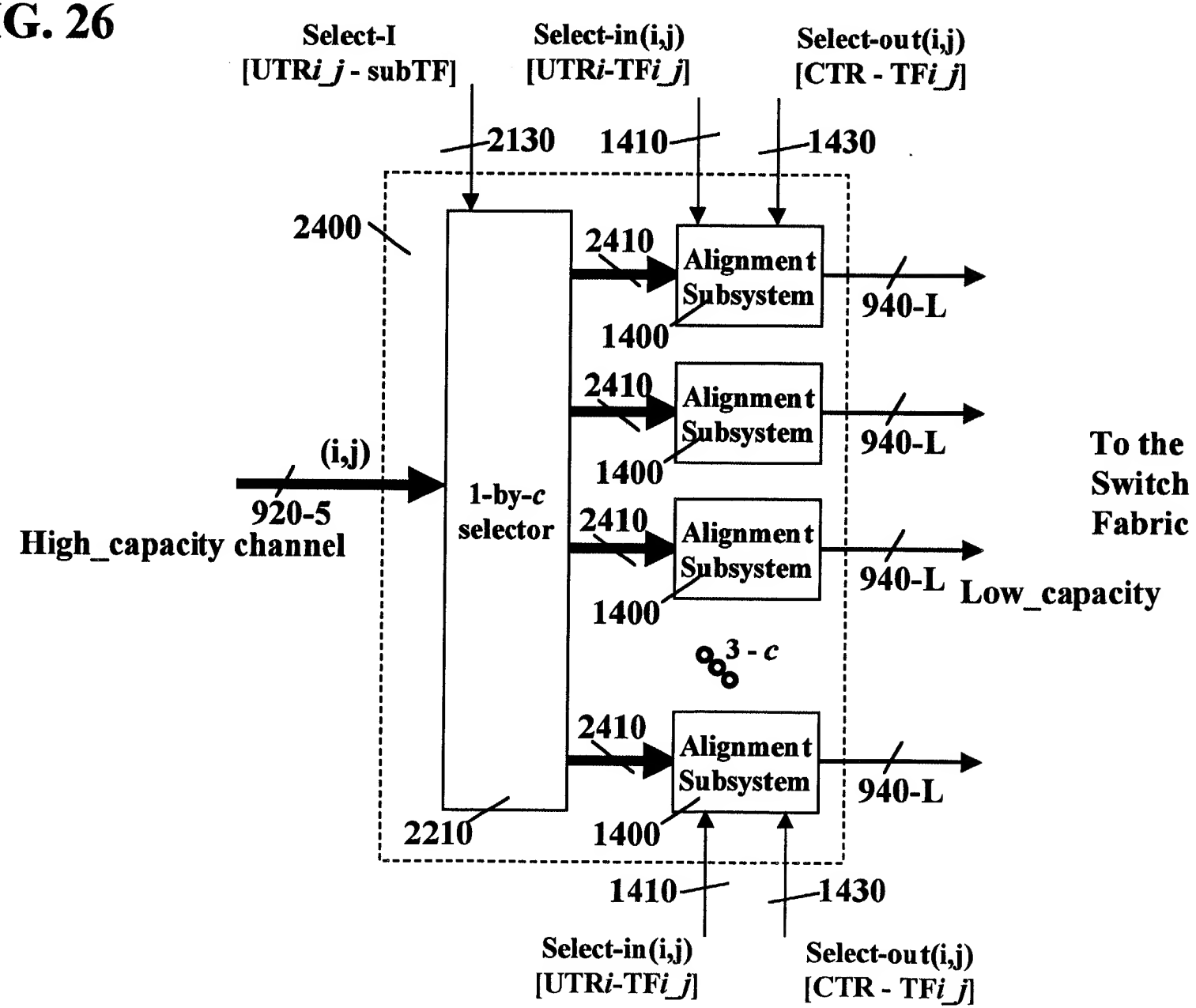
FIG. 25

N: number of input/output channels. E.g., N=256
L • Low_capacity = N_high • High_capacity + N_low • Low_capacity
L > N



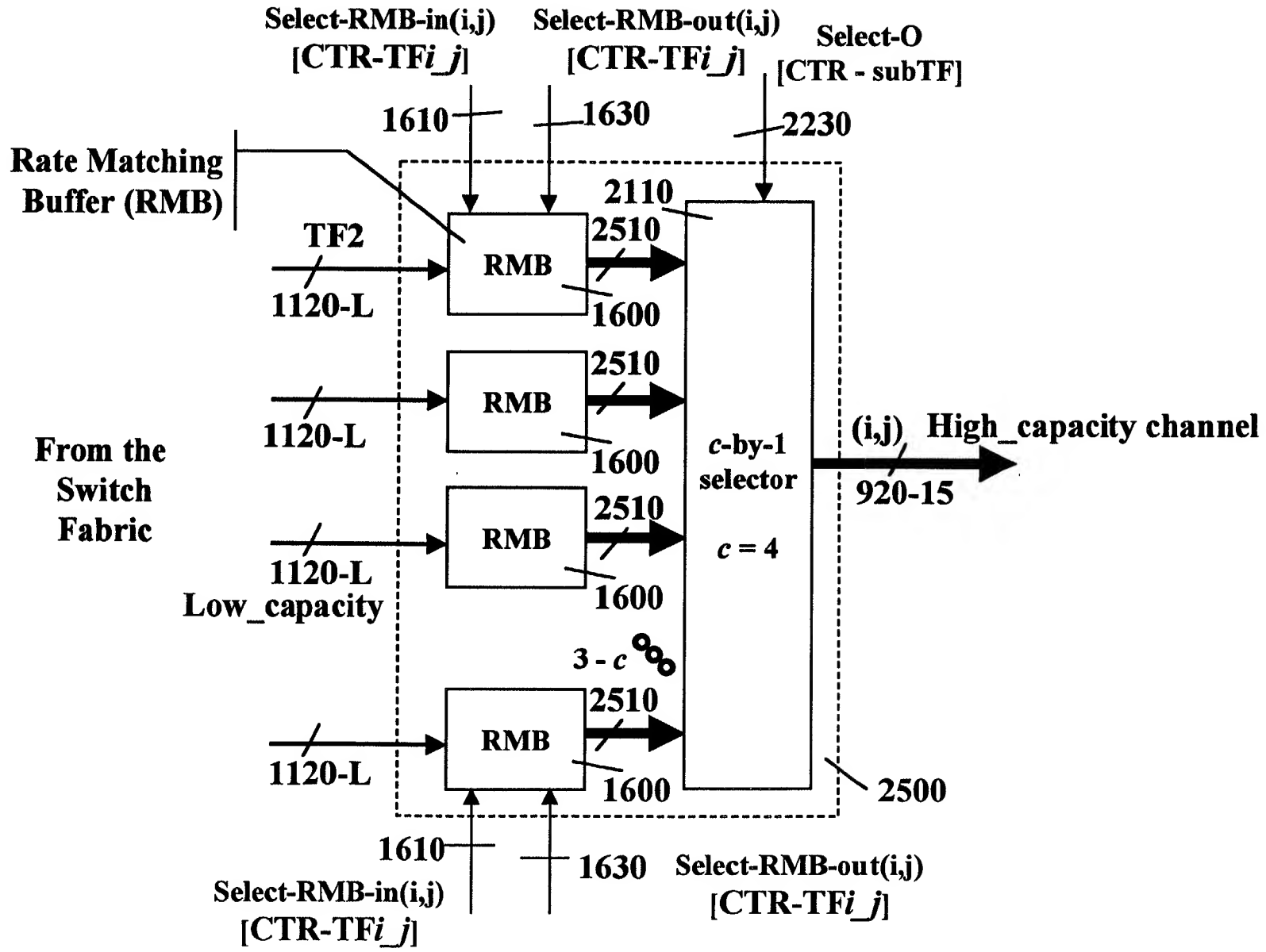
Time Driven Switch

FIG. 26


Select-I
[UTRi_j - subTF]
Select-in(i,j)
[UTRi-TFi_j]
Select-out(i,j)
[CTR - TFi_j]
2130
1410
1430
2400
2410
Alignment Subsystem
940-L
1400
(i,j)
920-5
High_capacity channel
1-by-c selector
To the Switch Fabric
3 - c
Low_capacity
2210

PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 27 OF 65

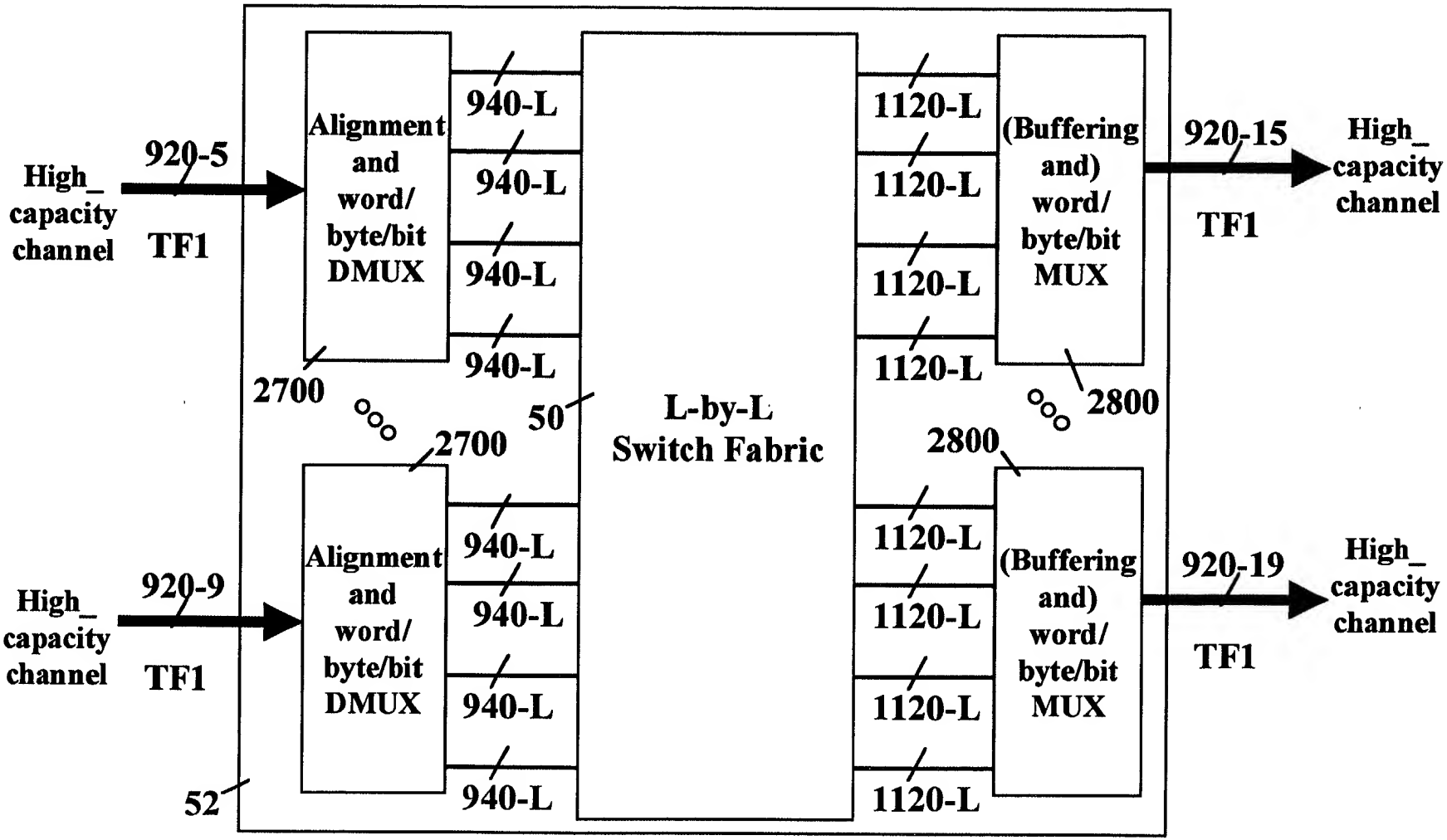
FIG. 27



PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 28 OF 65

FIG. 28

N: number of input/output channels. E.g., N=256
L • Low_capacity = N • High_capacity
L = c • N > N



Time Driven Switch

PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 29 OF 65

FIG. 29

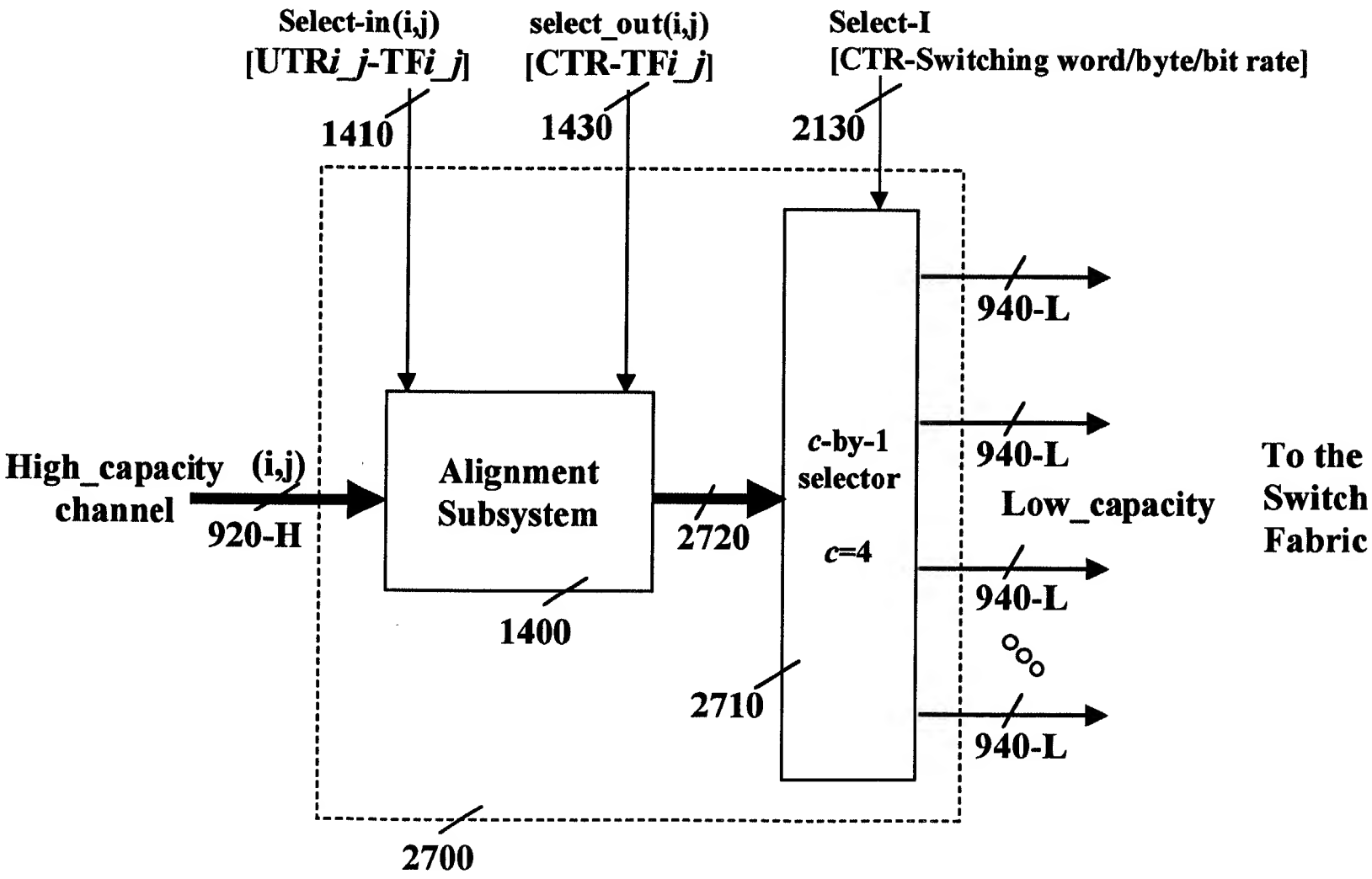
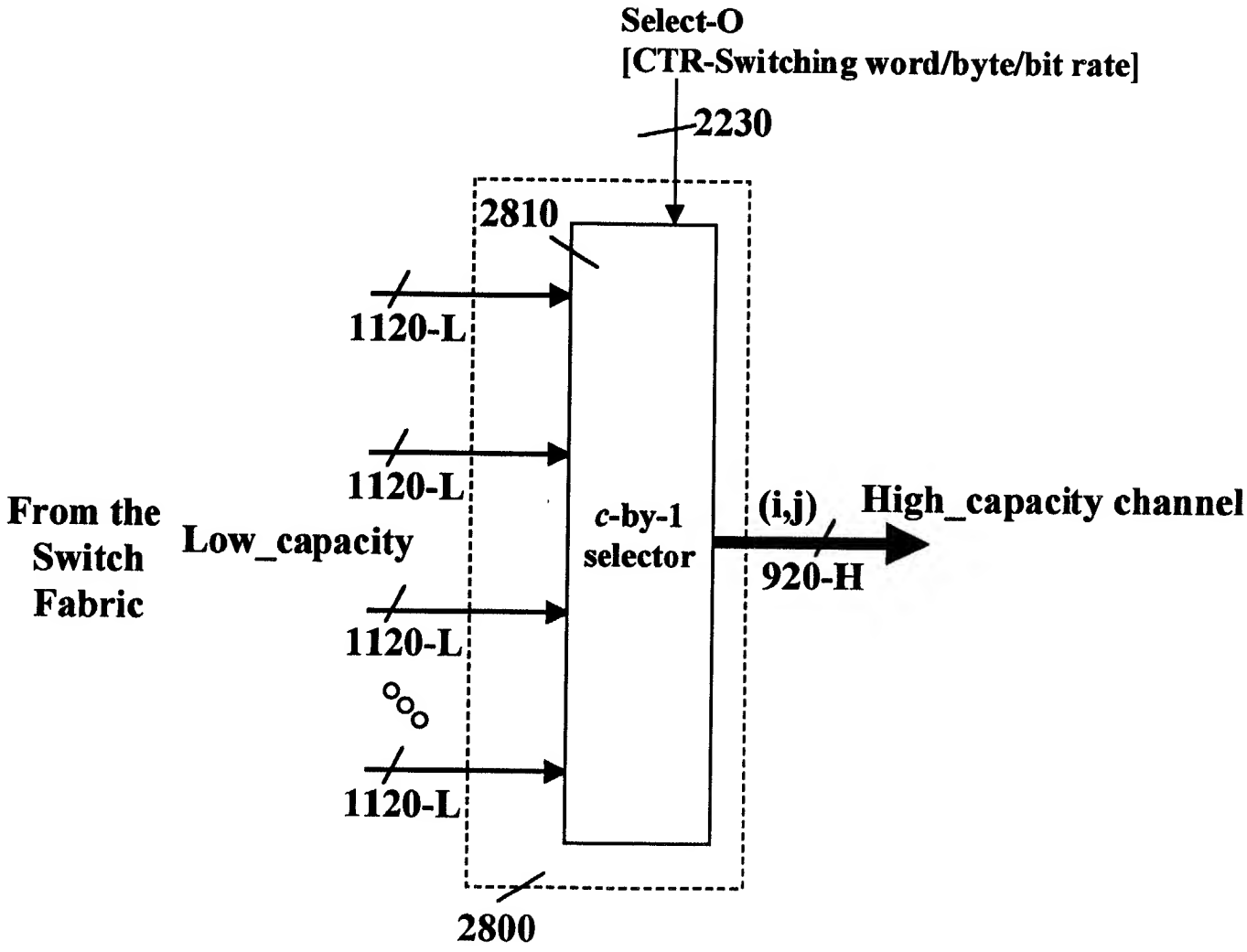
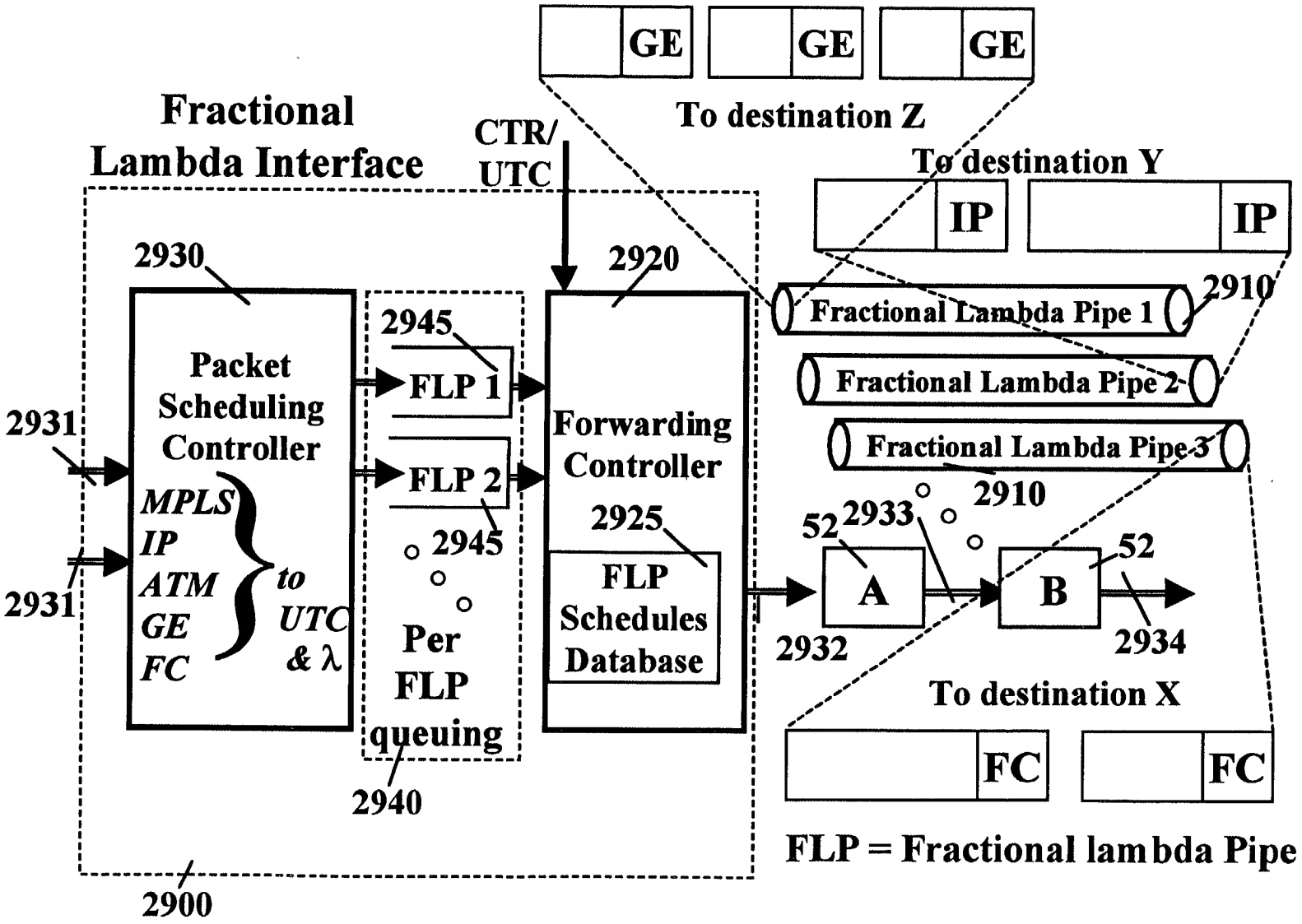


FIG. 30


Select-O
[CTR-Switching word/byte/bit rate]
2230
2810
1120-L
1120-L
1120-L
1120-L
From the Switch Fabric
Low_capacity
c-by-1 selector
(i,j)
High_capacity channel
920-H
2800

PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 31 OF 65

FIG. 31



PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 32 OF 65

FIG. 32

Channel Capacity		TF Duration	TF Size		STS-1s	TFs/s
51.84	STS- 1	250	1620	1512	2	4000
		500	3240	3024	4	2000
		1000	6480	6048	8	1000
155.52	STS- 3	125	2430	2268	3	8000
		250	4860	4536	6	4000
		500	9720	9072	12	2000
622.08	STS- 12	62.5	4860	4536	6	16000
		125	9720	9072	12	8000
		250	19440	18144	24	4000
2488.32	STS- 48	62.5	19440	18144	24	16000
		31.25	9720	9072	12	32000
		15.625	4860	4536	6	64000
9953.28	STS- 192	7.8125	9720	9072	12	128000
		15.625	19440	18144	24	64000
1000	GE	125	15625	15625	19.3	8000
		100	12500	12500	15.4	10000
		80	10000	10000	12.3	12500
10000	10GE	15.625	19531.25	19531.3	24.1	64000
		12.5	15625	15625	19.3	80000
		10	12500	12500	15.4	100000

TQT360 "9201360

FIG. 33

Ch Capacity		TF Dur.	TF Size	GE TFs	TFs/s
1000	GE	80	10000	1.0	12500
51.84	STS- 1	250	1512	0.15	4000
		500	3024	0.30	2000
		1000	6048	0.60	1000
155.5	STS- 3	125	2268	0.23	8000
		250	4536	0.45	4000
		500	9072	0.91	2000
622.1	STS- 12	62.5	4536	0.45	16000
		125	9072	0.91	8000
		250	18144	1.81	4000
2488	STS- 48	62.5	18144	1.81	16000
		31.25	9072	0.91	32000
		15.625	4536	0.45	64000
9953	STS- 192	7.8125	9072	0.91	128000
		15.625	18144	1.81	64000
10000	10GE	8	10000	1.00	125000
		16	20000	2.00	62500

FIG. 34

Ch Capacity		TF Dur.	TF Size	GE TFs	TFs/s
1000	GE	62.5	7812.5	1.0	16000
51.84	STS- 1	250	1512	0.19	4000
		500	3024	0.39	2000
		1000	6048	0.77	1000
155.52	STS- 3	125	2268	0.29	8000
		250	4536	0.58	4000
		500	9072	1.16	2000
622.08	STS- 12	62.5	4536	0.58	16000
		125	9072	1.16	8000
		250	18144	2.32	4000
2488.32	STS- 48	62.5	18144	2.32	16000
		31.25	9072	1.16	32000
		15.625	4536	0.58	64000
9953.28	STS- 192	7.8125	9072	1.16	128000
		15.625	18144	2.32	64000
10000	10GE	12.5	15625	2.00	80000
		25	31250	4.00	40000

FIG. 35

***TF Alignment of* UTR(j) *to* UTC - with three input queues - principle of operation:**

The same queue is not used simultaneously for:

1. Receiving data packets from the serial link, and

2. Forwarding data packets to the switch

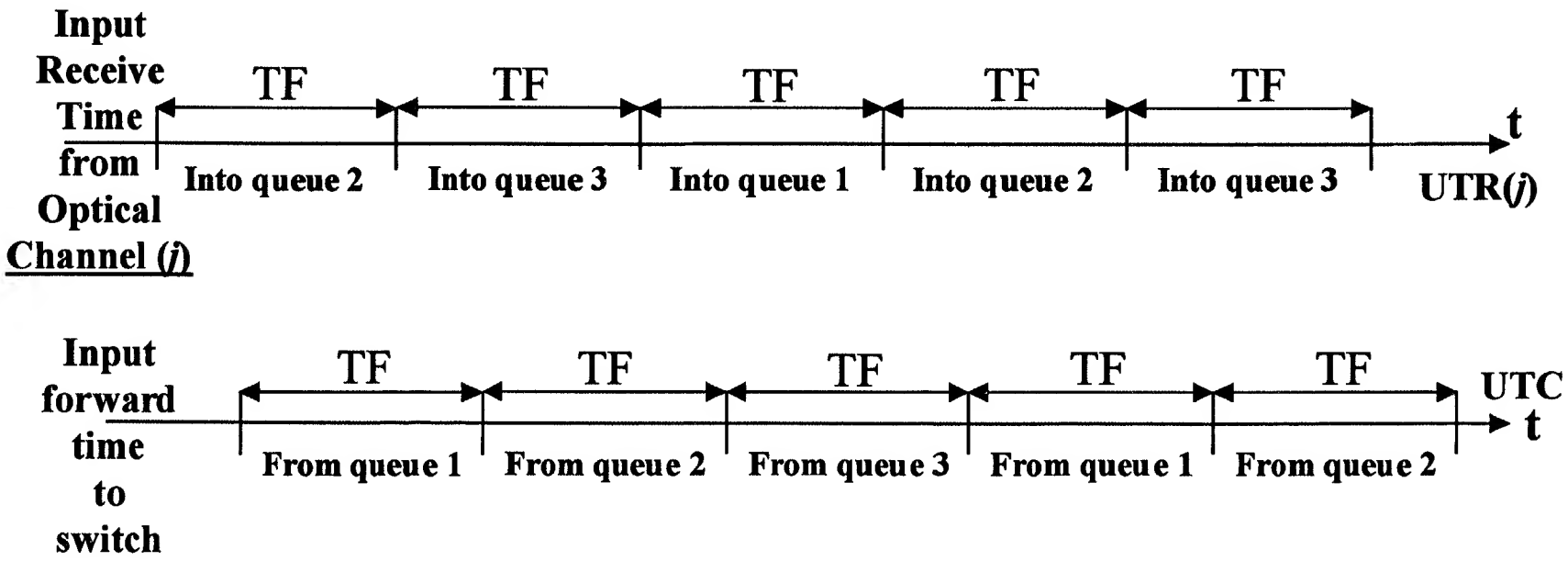
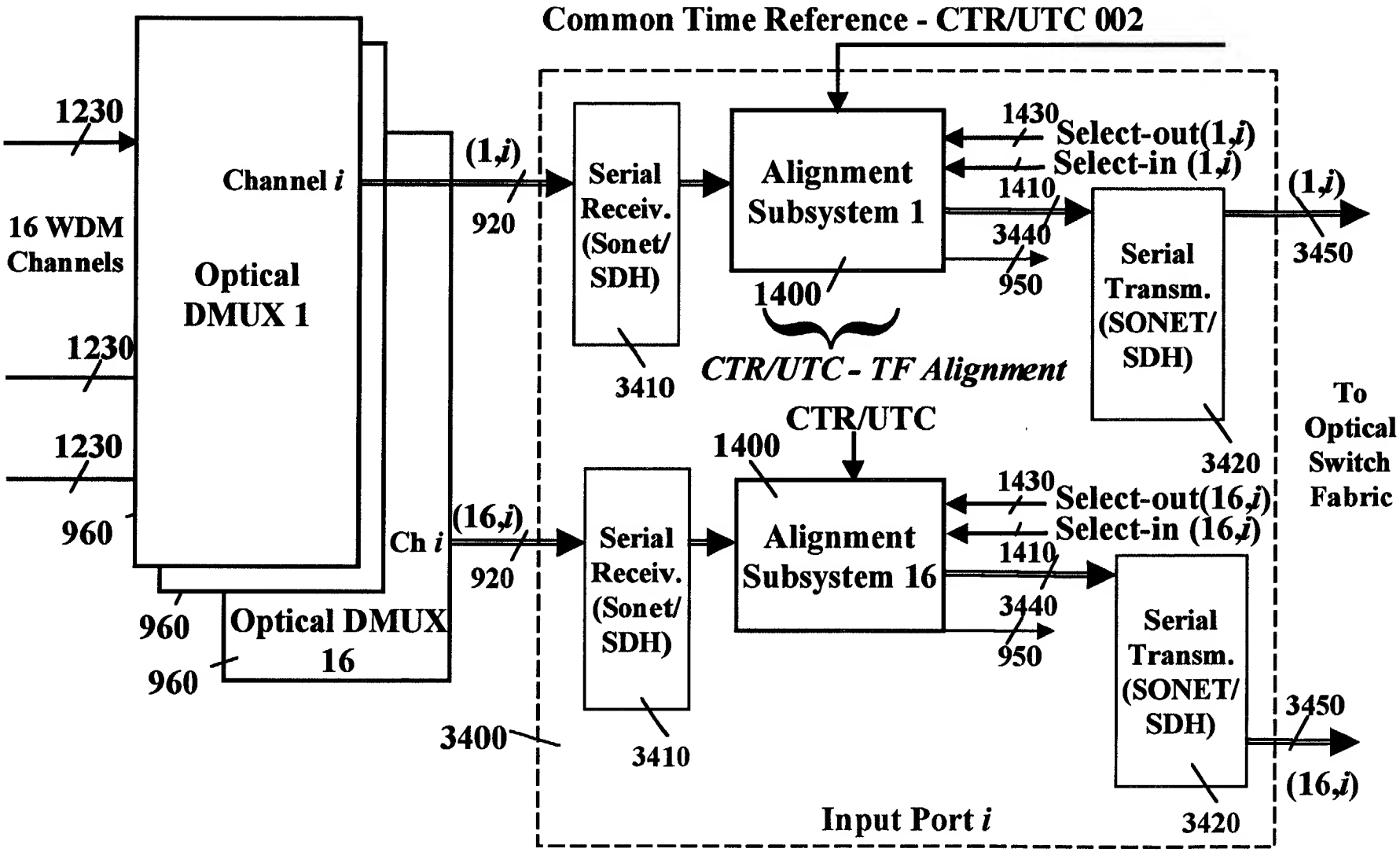
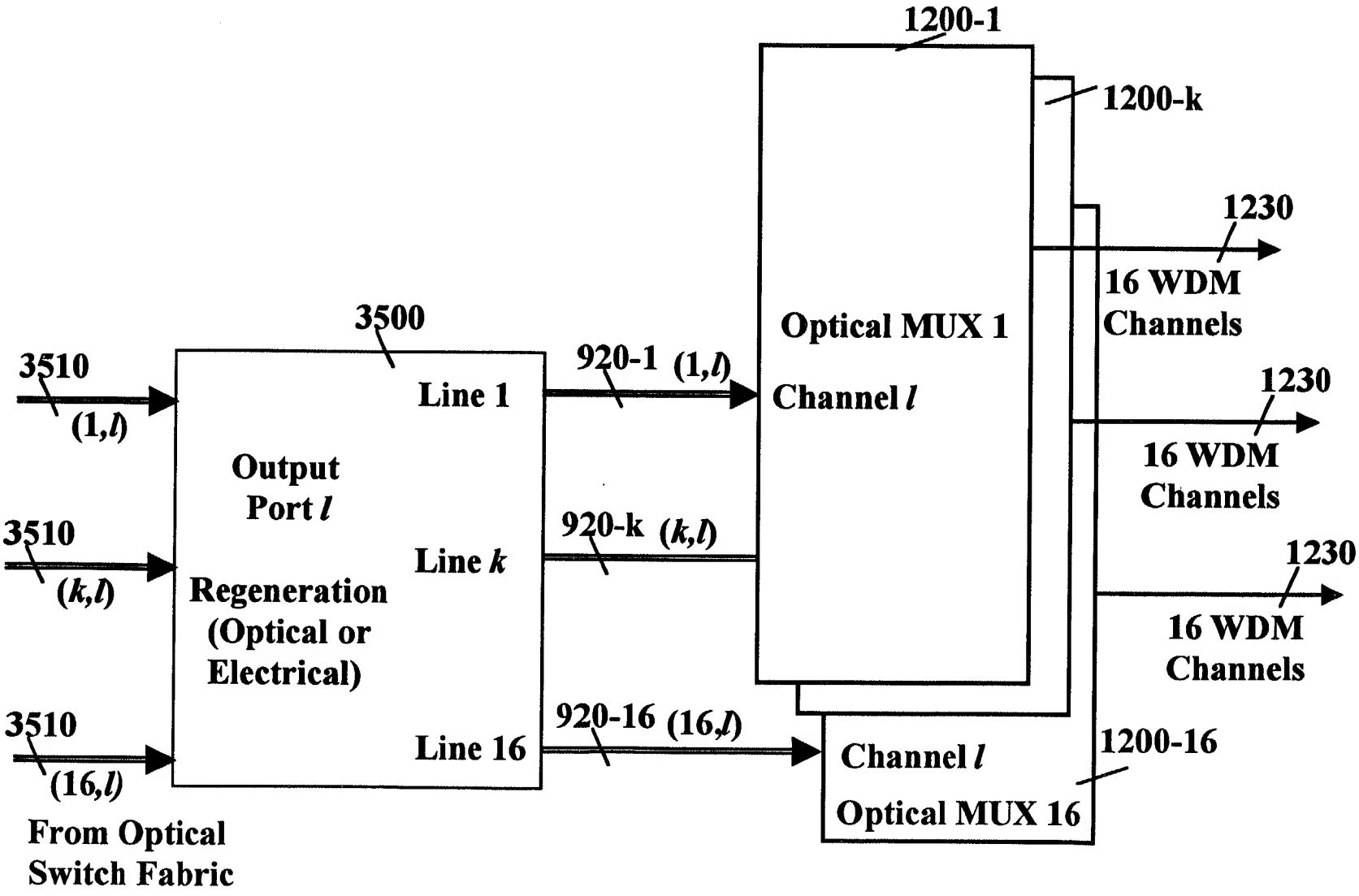


FIG. 36


Common Time Reference - CTR/UTC 002
1230
16 WDM Channels
Optical DMUX 1
Channel i
1230
1230
960
960
960
Optical DMUX 16
Ch i
(1,i)
920
(16,i)
920
Serial Receiv. (Sonet/ SDH)
3410
Serial Receiv. (Sonet/ SDH)
3410
3400
Alignment Subsystem 1
1400
CTR/UTC - TF Alignment
Alignment Subsystem 16
1400
CTR/UTC
1430
Select-out(1,i)
Select-in (1,i)
1410
3440
950
1430
Select-out(16,i)
Select-in (16,i)
1410
3440
950
Serial Transm. (SONET/ SDH)
3420
Serial Transm. (SONET/ SDH)
3420
(1,i)
3450
3450
(16,i)
To Optical Switch Fabric
Input Port i

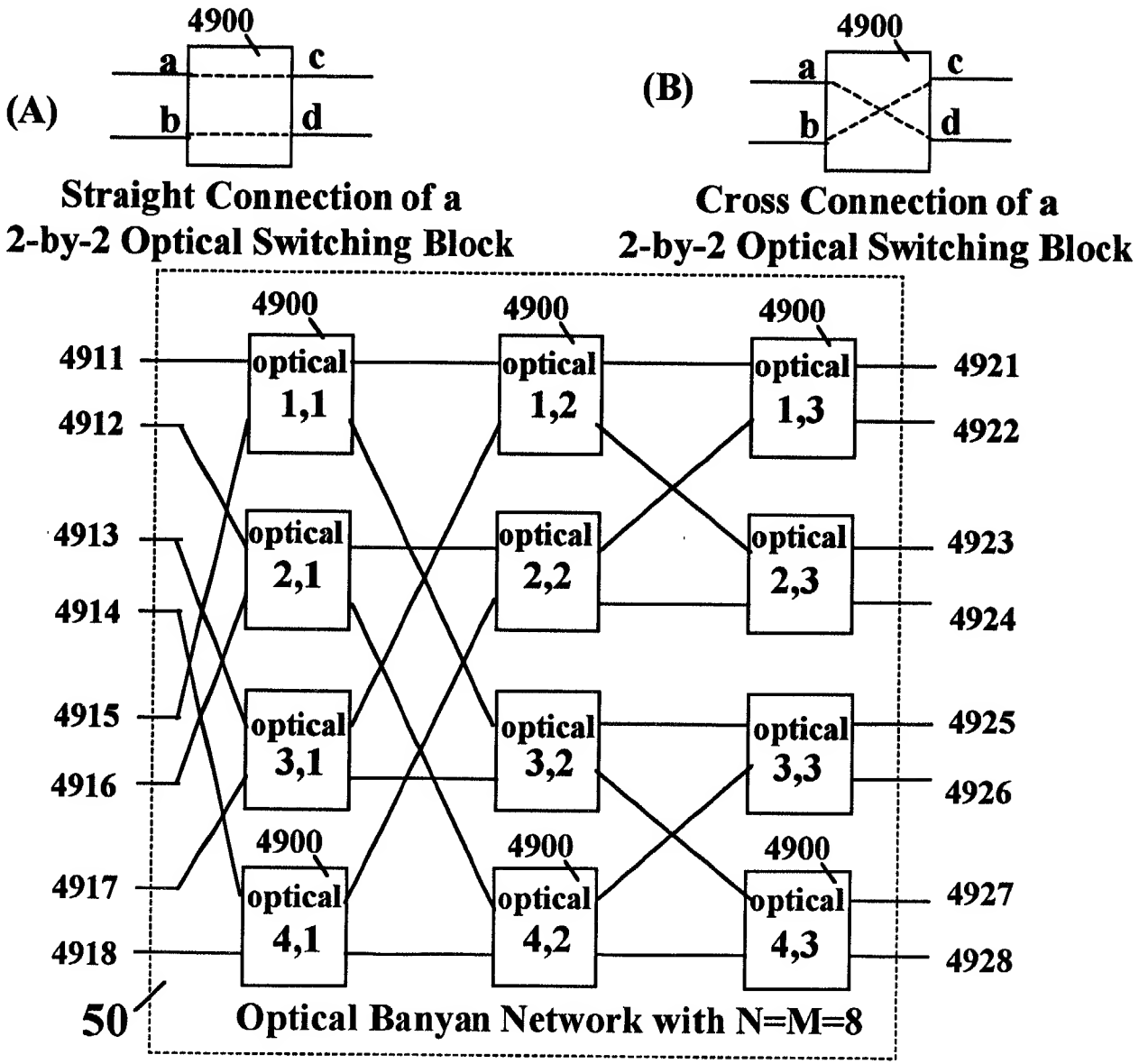
PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 37 OF 65

FIG. 37



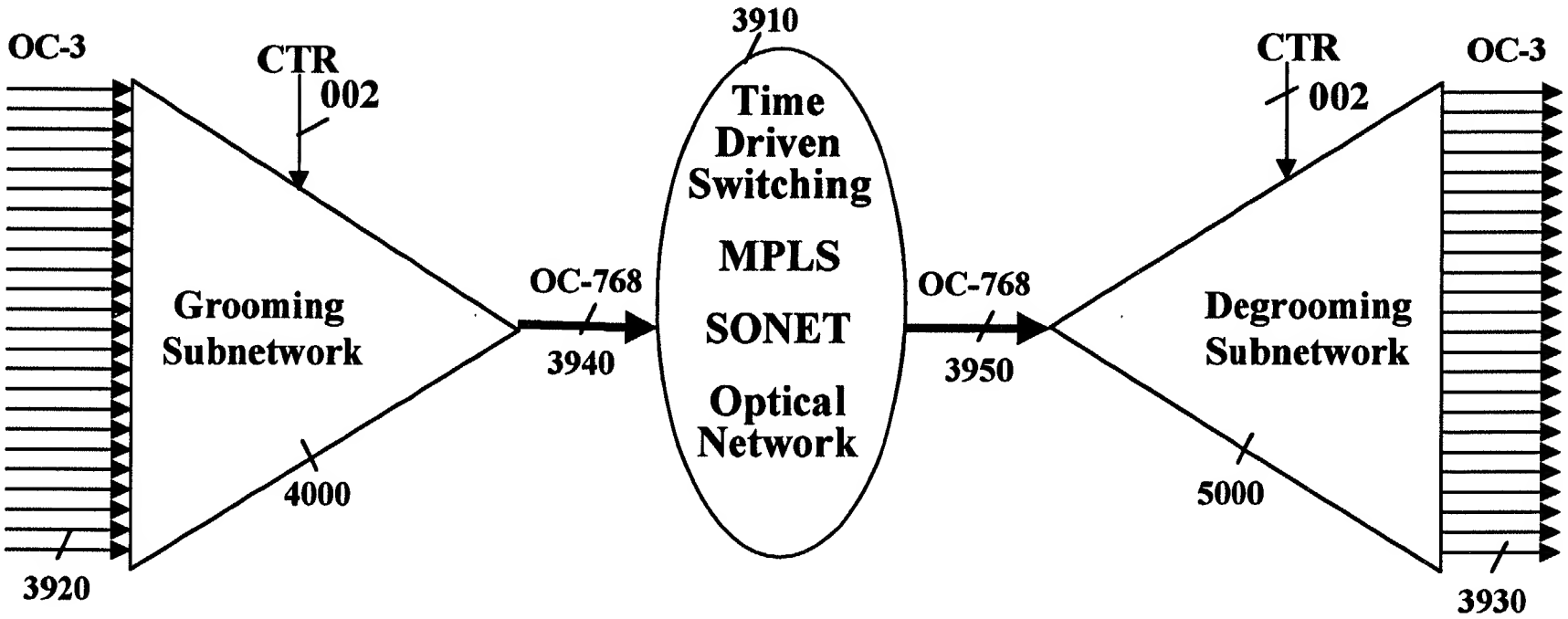
PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 38 OF 65

FIG. 38



PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 39 OF 65

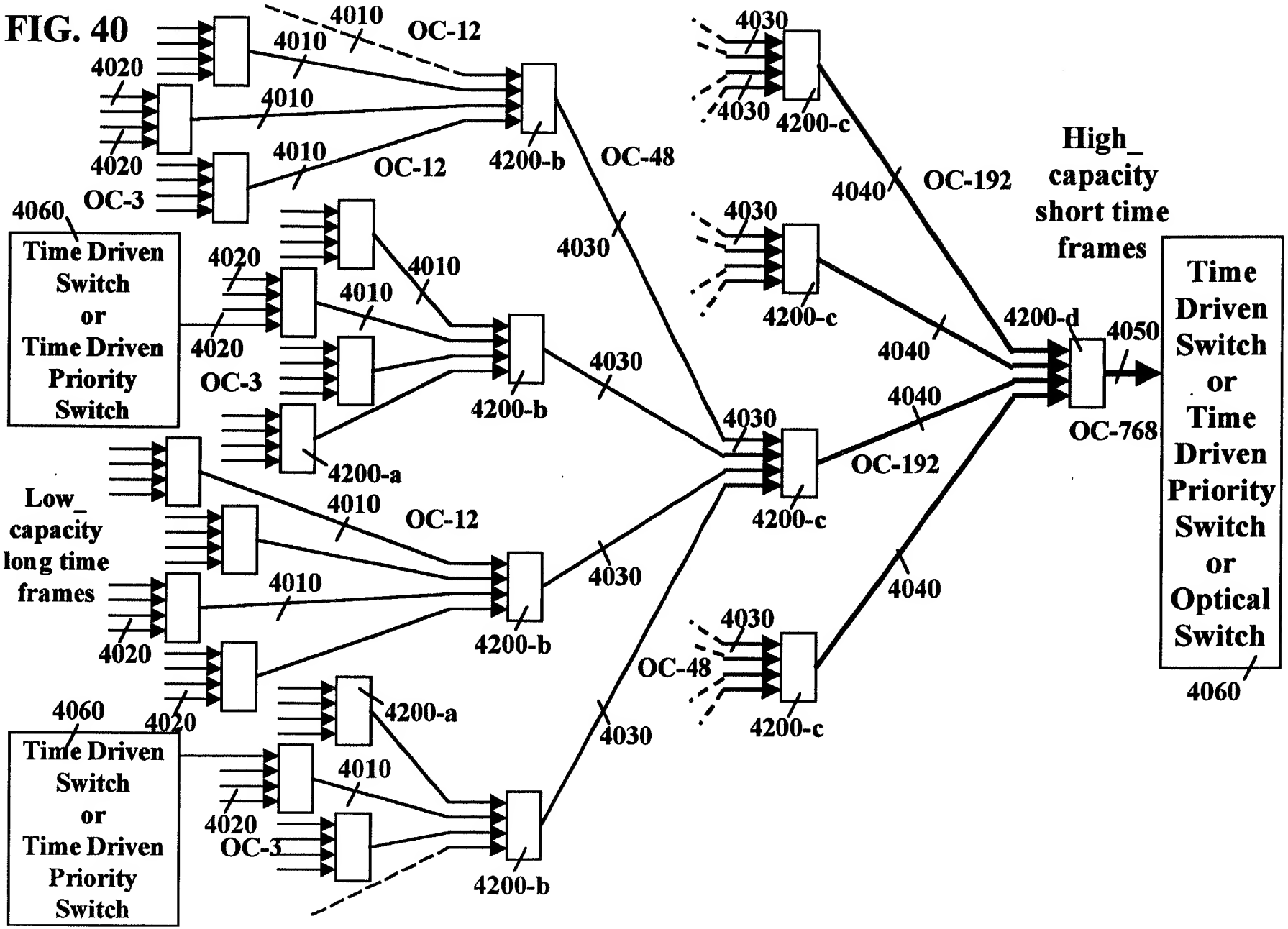
FIG. 39



PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 40 OF 65

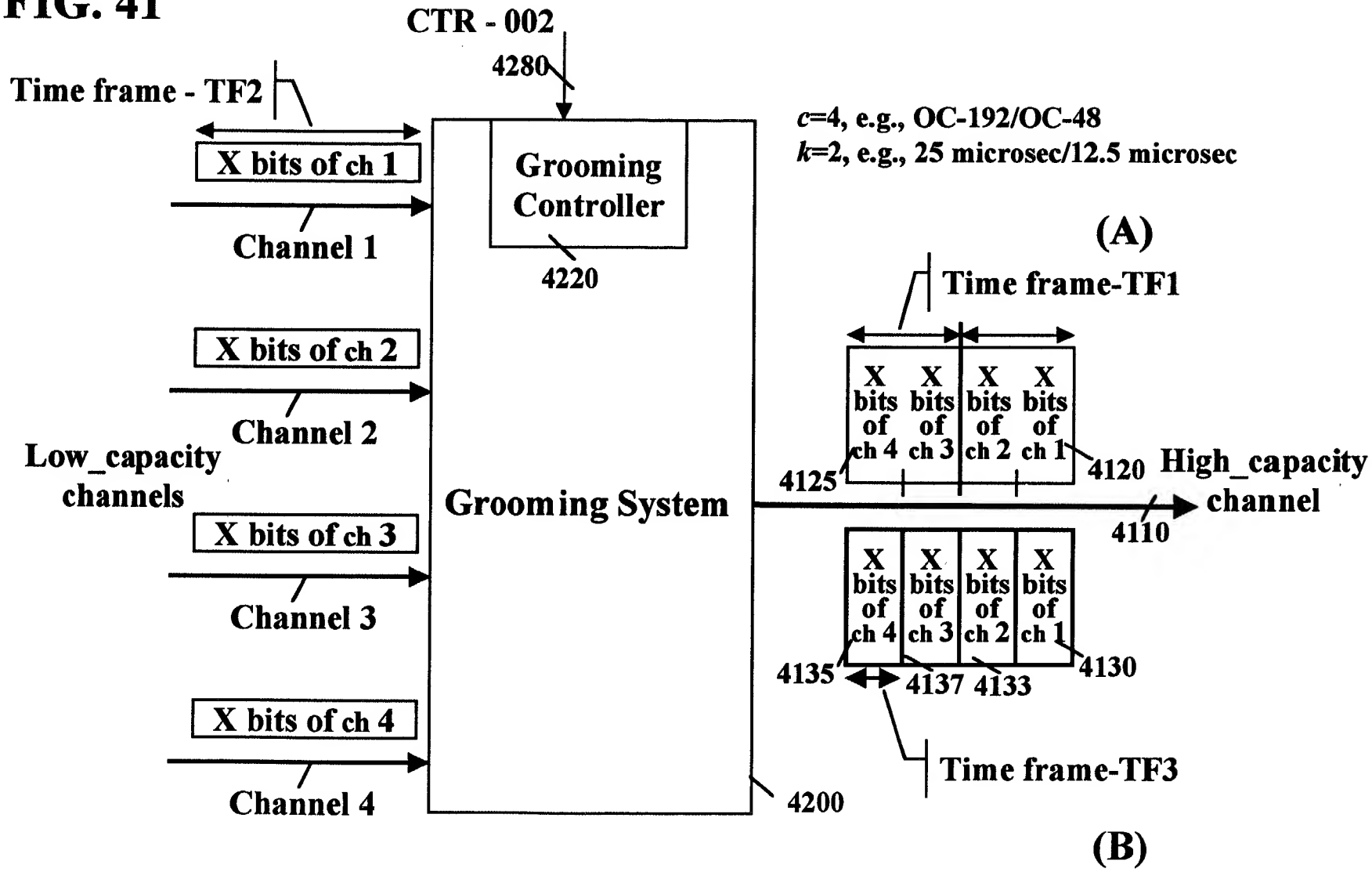
US 2001/0028660 A1

FIG. 40



PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 41 OF 65

FIG. 41



PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 42 OF 65

FIG. 42

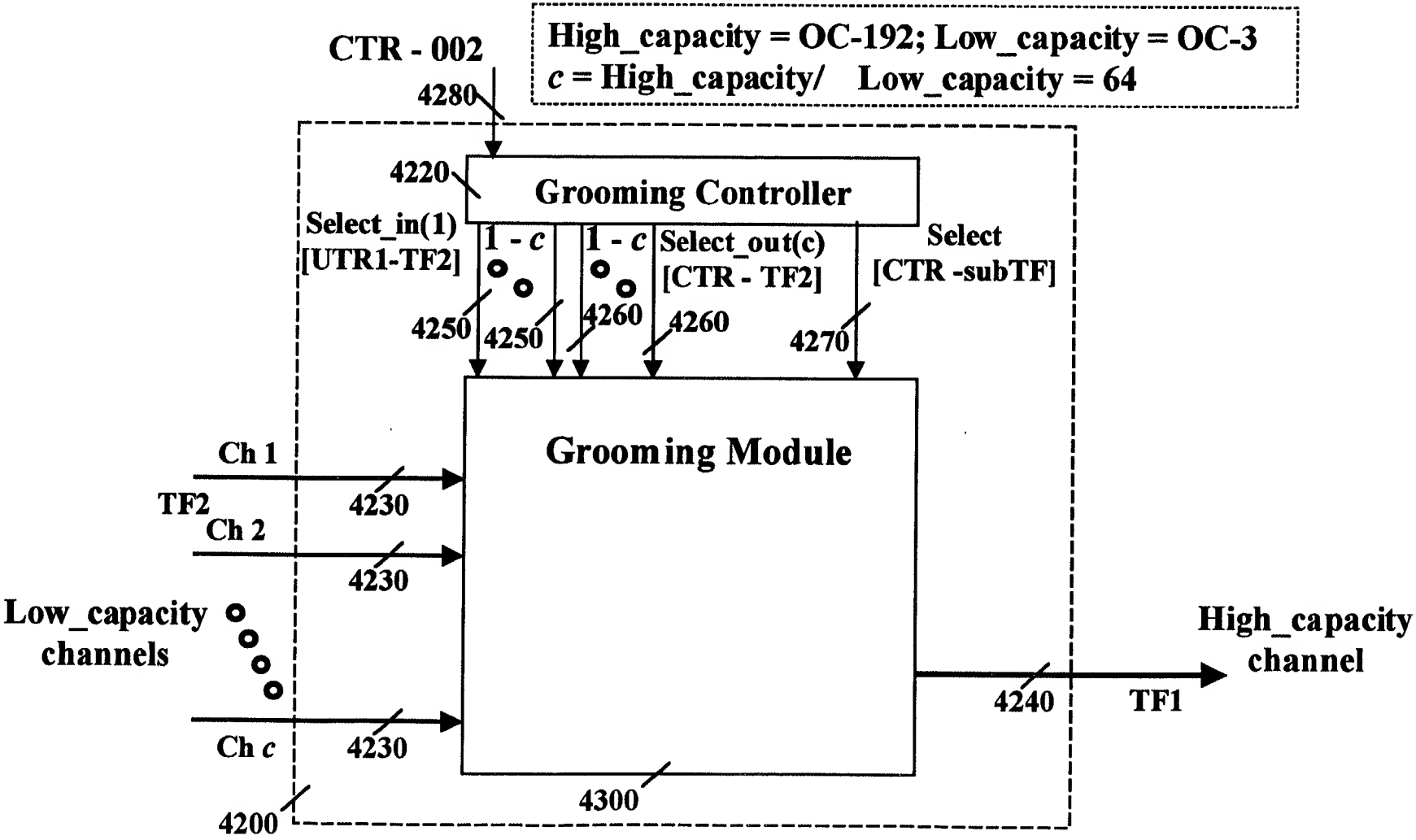


FIG. 43

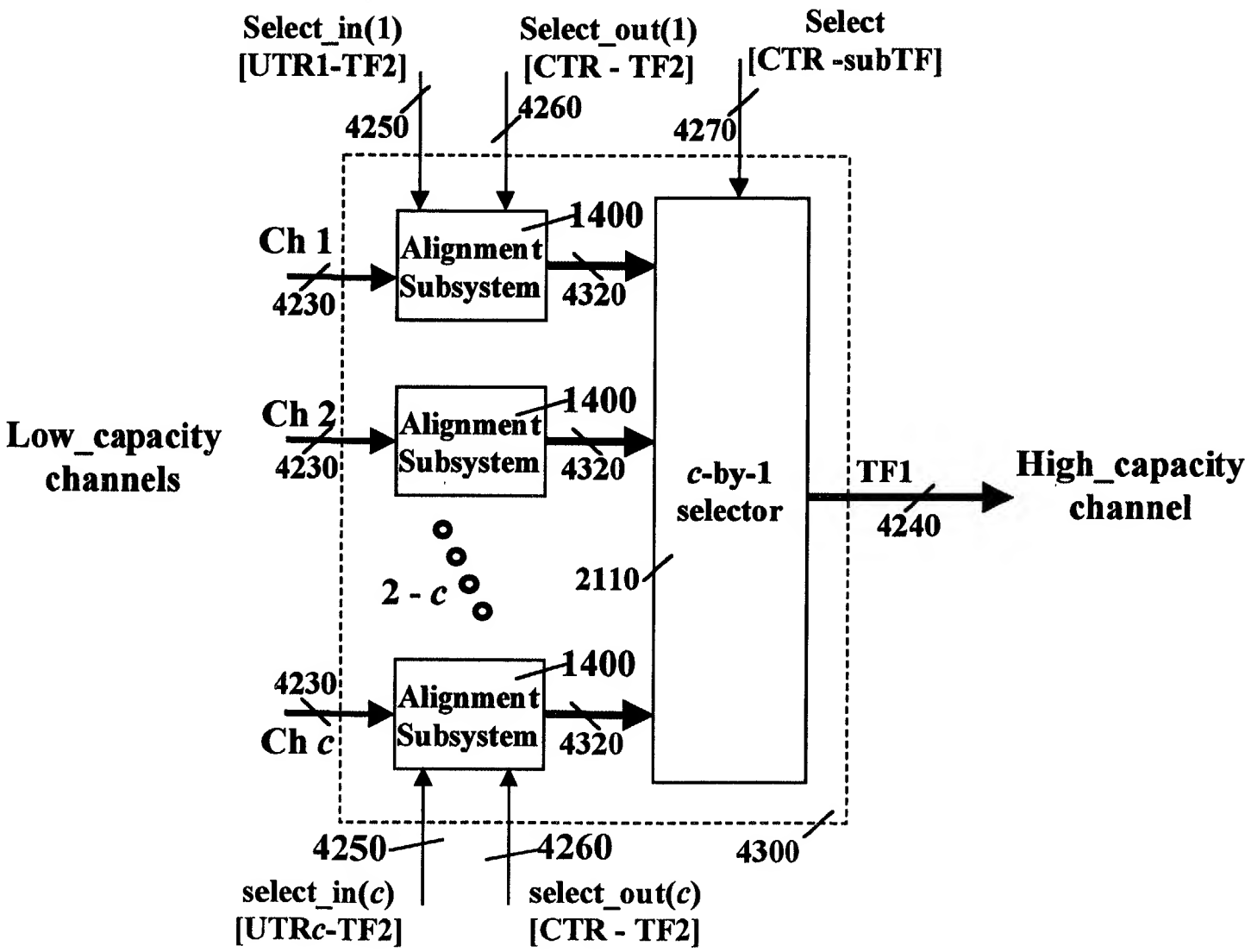

Select_in(1)
[UTR1-TF2]
Select_out(1)
[CTR - TF2]
Select
[CTR -subTF]
4250
4260
4270
Ch 1
4230
Alignment Subsystem
1400
4320
Low_capacity channels
Ch 2
4230
Alignment Subsystem
1400
4320
c-by-1 selector
TF1
4240
High_capacity channel
2 - c
2110
4230
Ch c
Alignment Subsystem
1400
4320
4250
4260
4300
select_in(c)
[UTRc-TF2]
select_out(c)
[CTR - TF2]

FIG. 44

- $CC1_length \cdot TF1 = CC2_length \cdot TF2 = CC3_length \cdot TF2$
- $TF2 = (SC1_length / SC2_length) \cdot TF1 = k \cdot TF1$, where the common cycles of *TF1* and *TF2* are aligned with respect to UTC.

For $k = 2$ and $c = 4$ (e.g., High_capacity=OC-192, Low_capacity=OC-48):

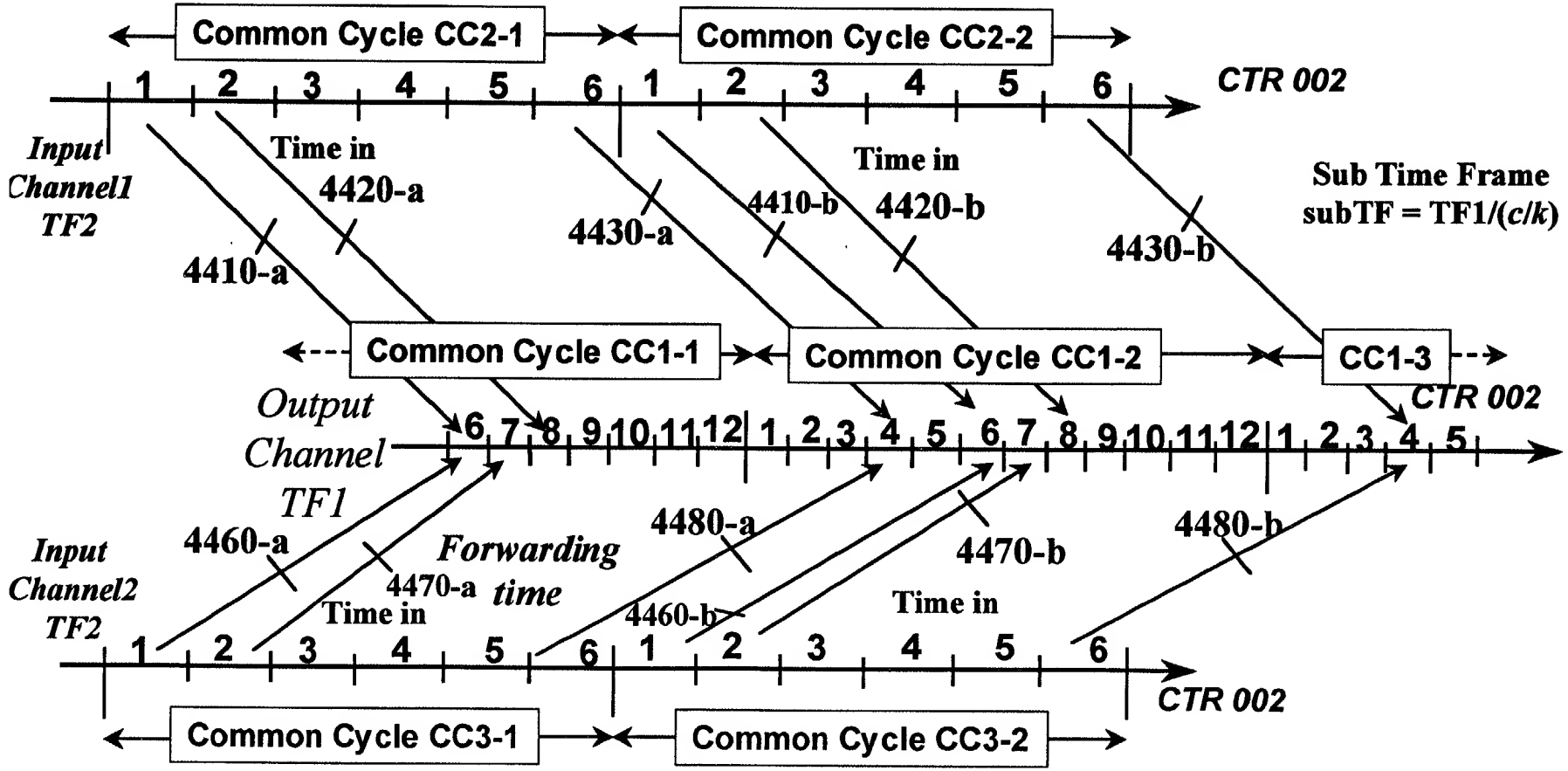


FIG. 45

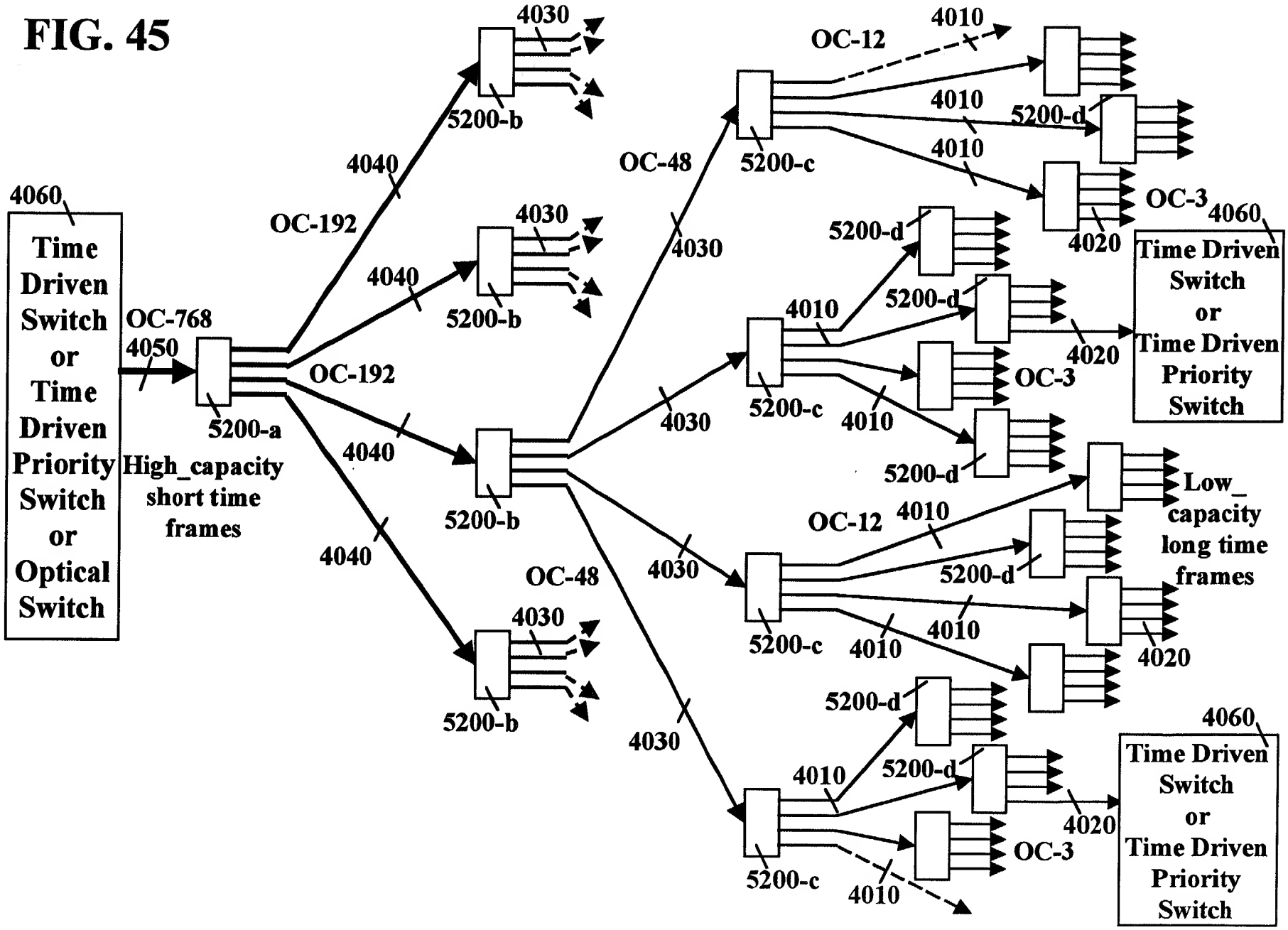
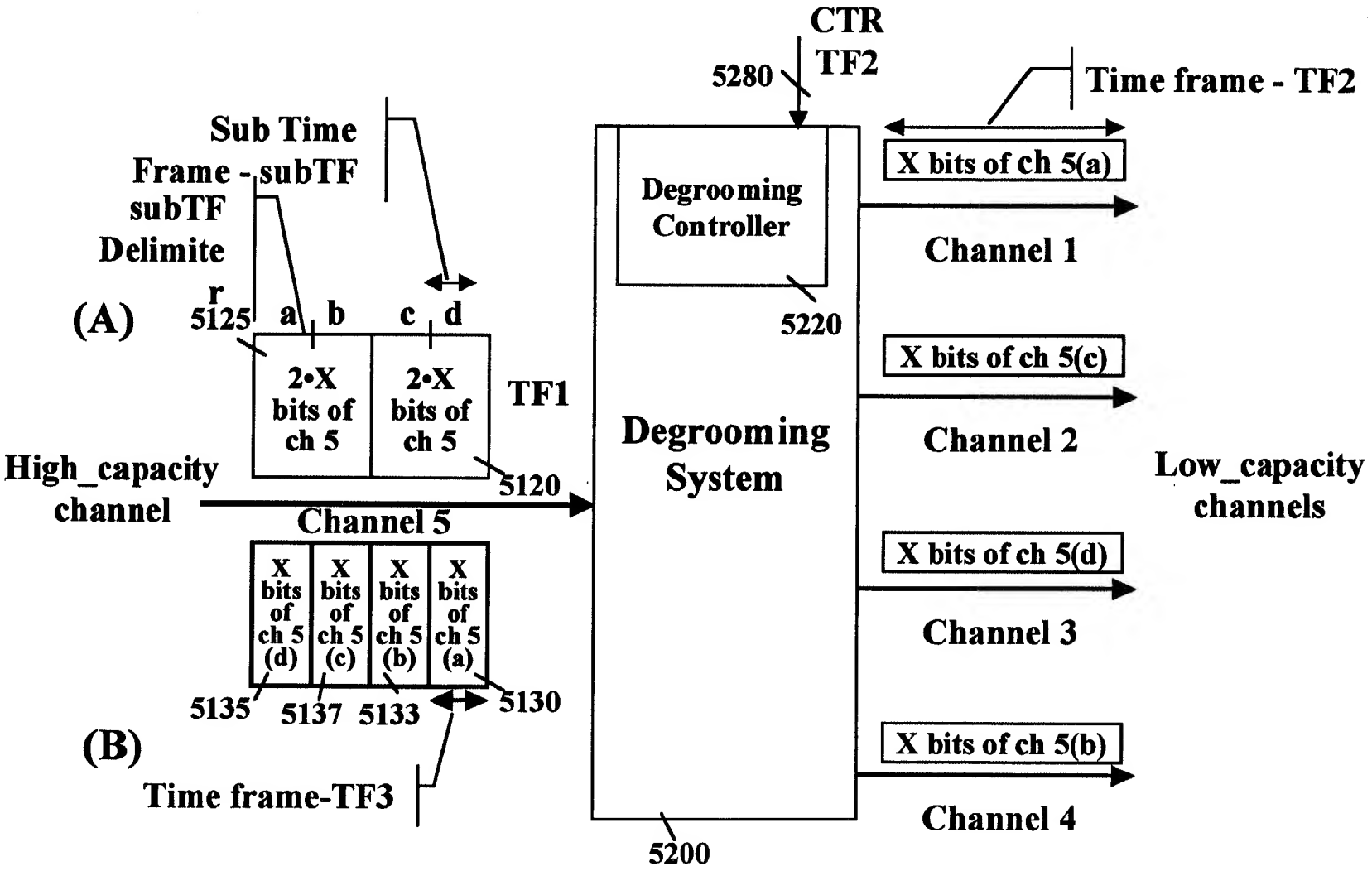

4060
Time Driven Switch or Time Driven Priority Switch or Optical Switch
OC-768
4050
5200-a
High_capacity short time frames
OC-192
4040
OC-192
4040
4040
5200-b
4030
5200-b
4030
5200-b
4030
OC-48
4030
OC-48
4030
4030
5200-c
OC-12
4010
4010
4010
5200-d
OC-3
4020
4060
Time Driven Switch or Time Driven Priority Switch
5200-c
4010
4010
4010
5200-d
5200-d
5200-d
OC-3
4020
5200-c
OC-12
4010
4010
4010
5200-d
5200-d
Low_ capacity long time frames
4020
5200-c
4010
4010
5200-d
5200-d
OC-3
4020
4060
Time Driven Switch or Time Driven Priority Switch
5200-c
4010

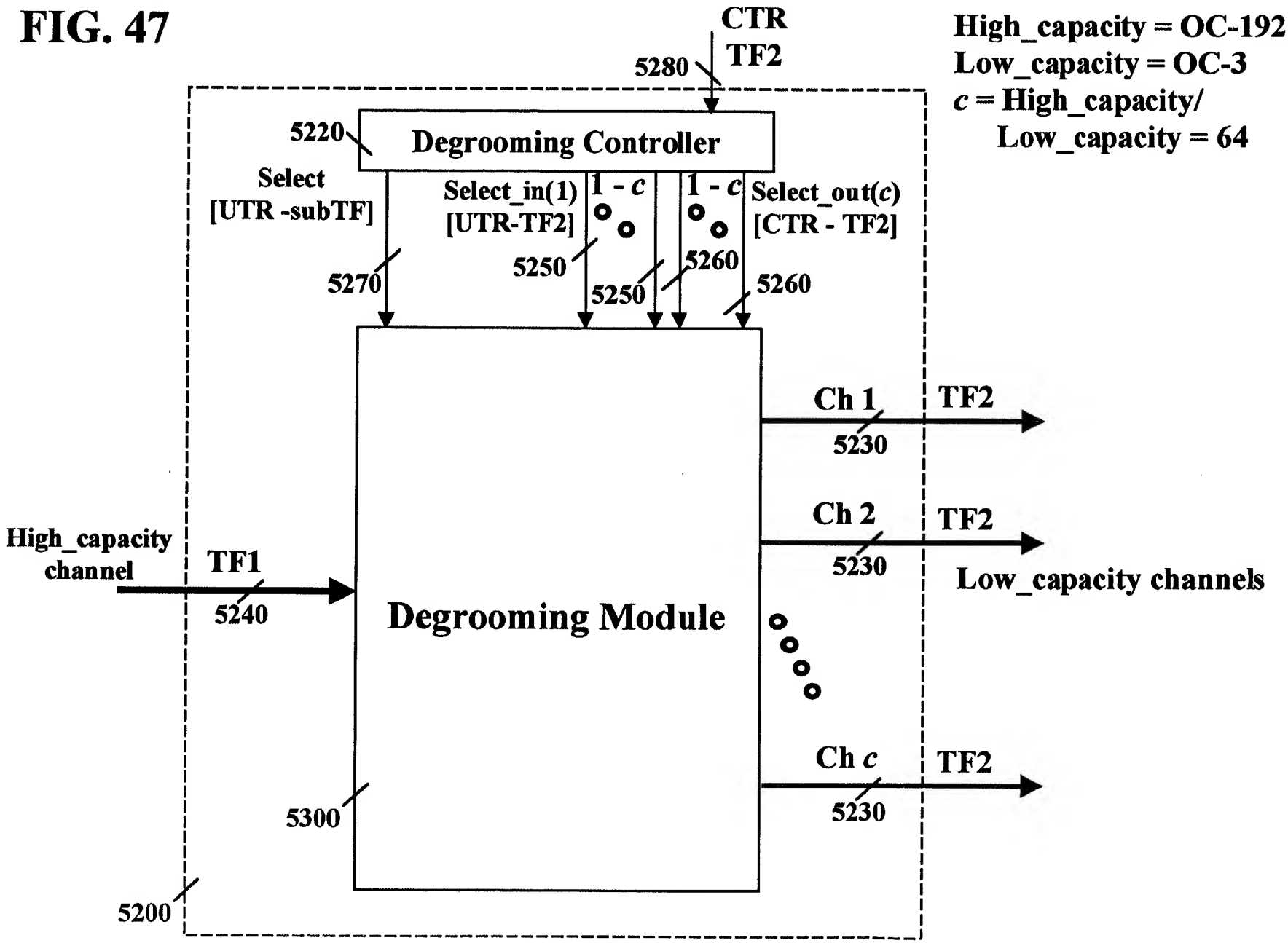
FIG. 46



c=4, e.g., OC-192/OC-48
k=2, e.g., 25 microsec/12.5 microsec

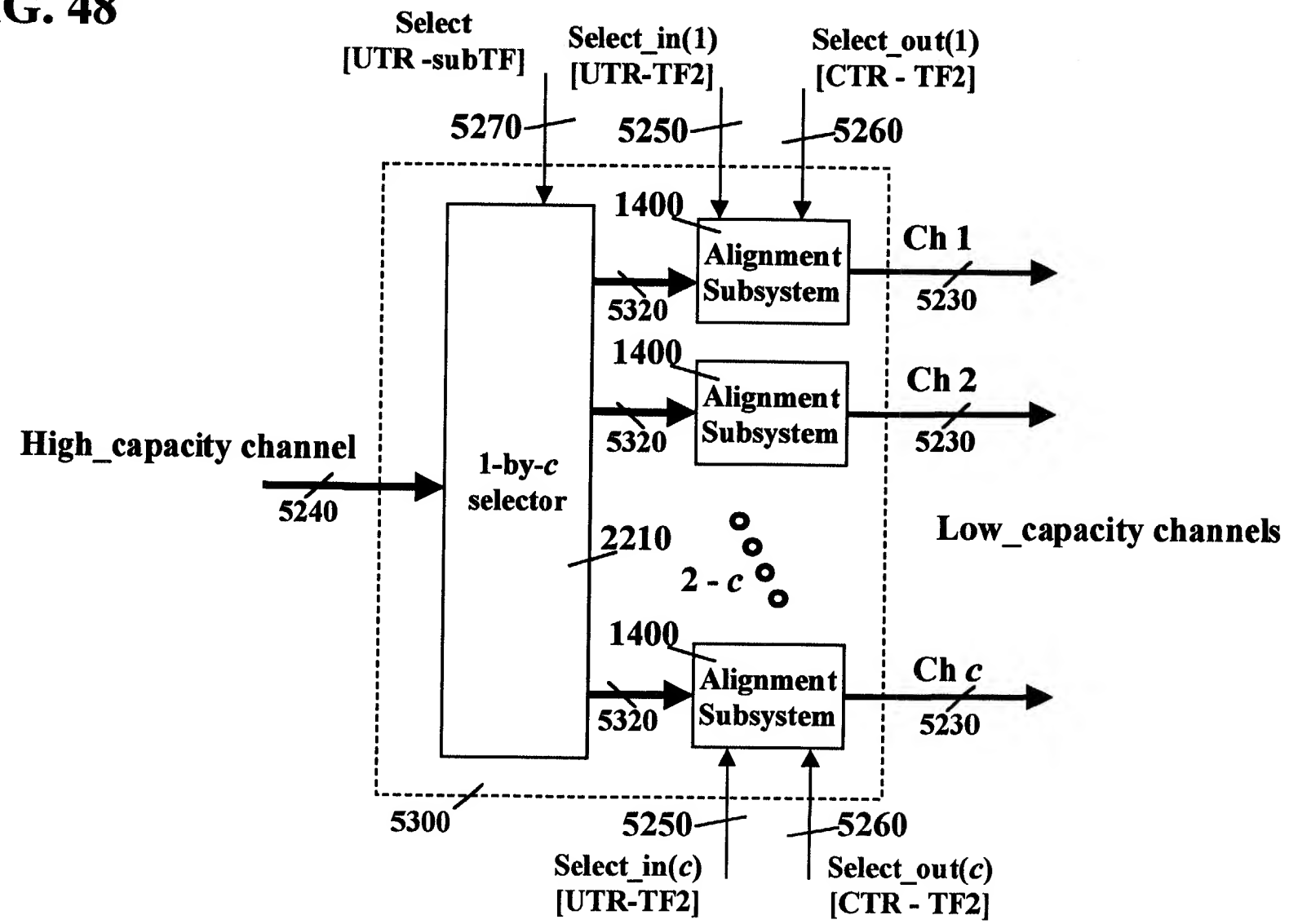
PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 47 OF 65

FIG. 47



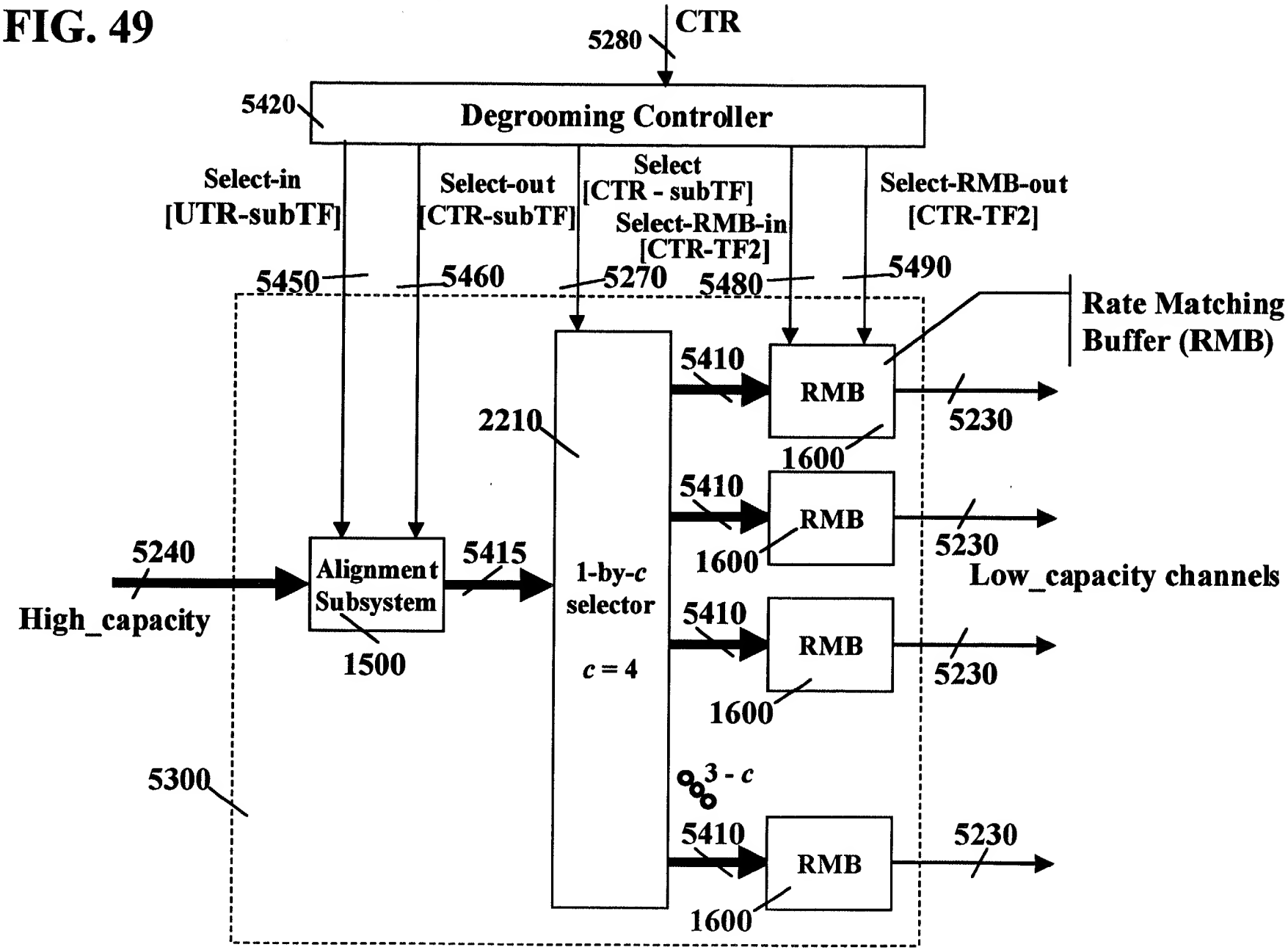
PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 48 OF 65

FIG. 48



PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 49 OF 65

FIG. 49



PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 50 OF 65

FIG. 50

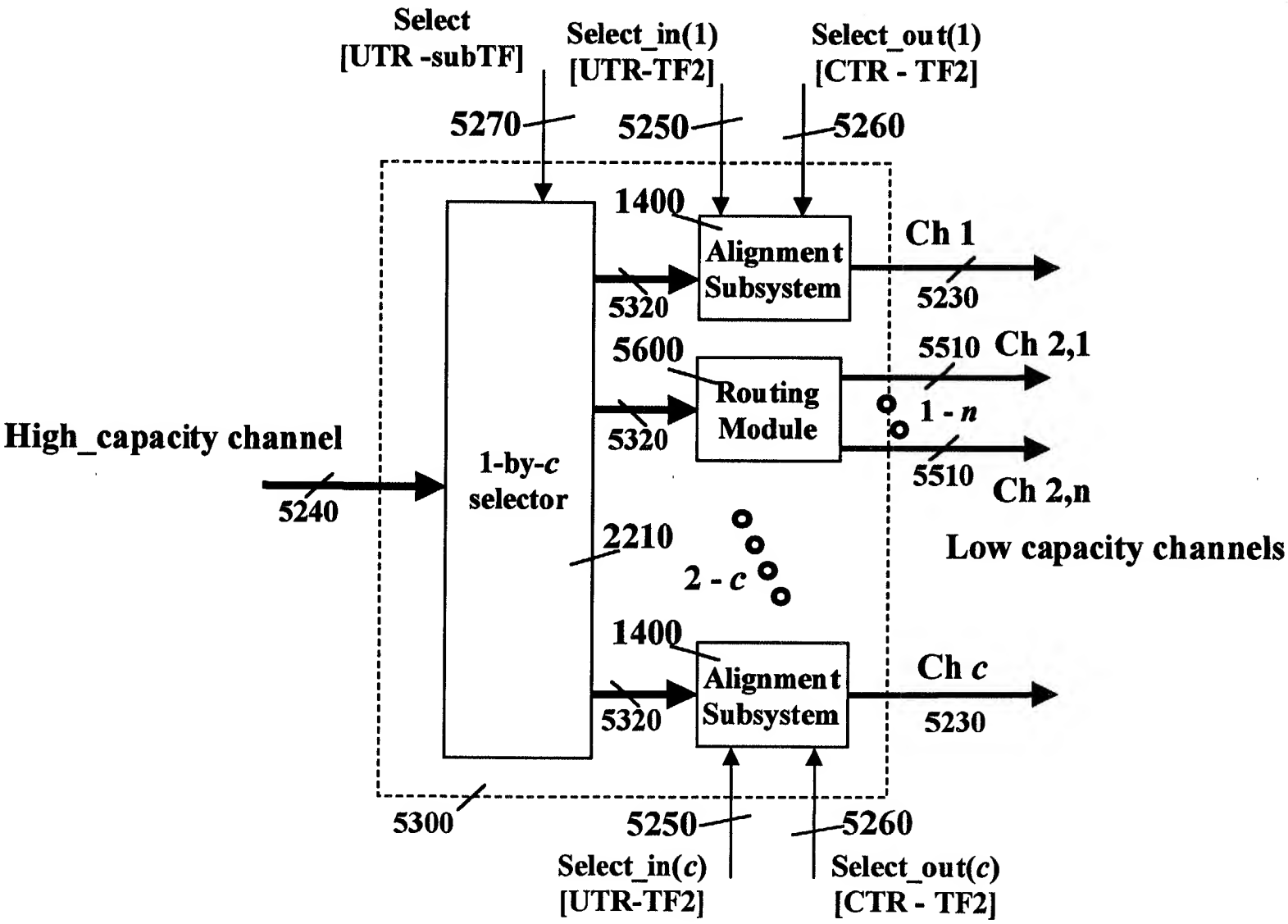
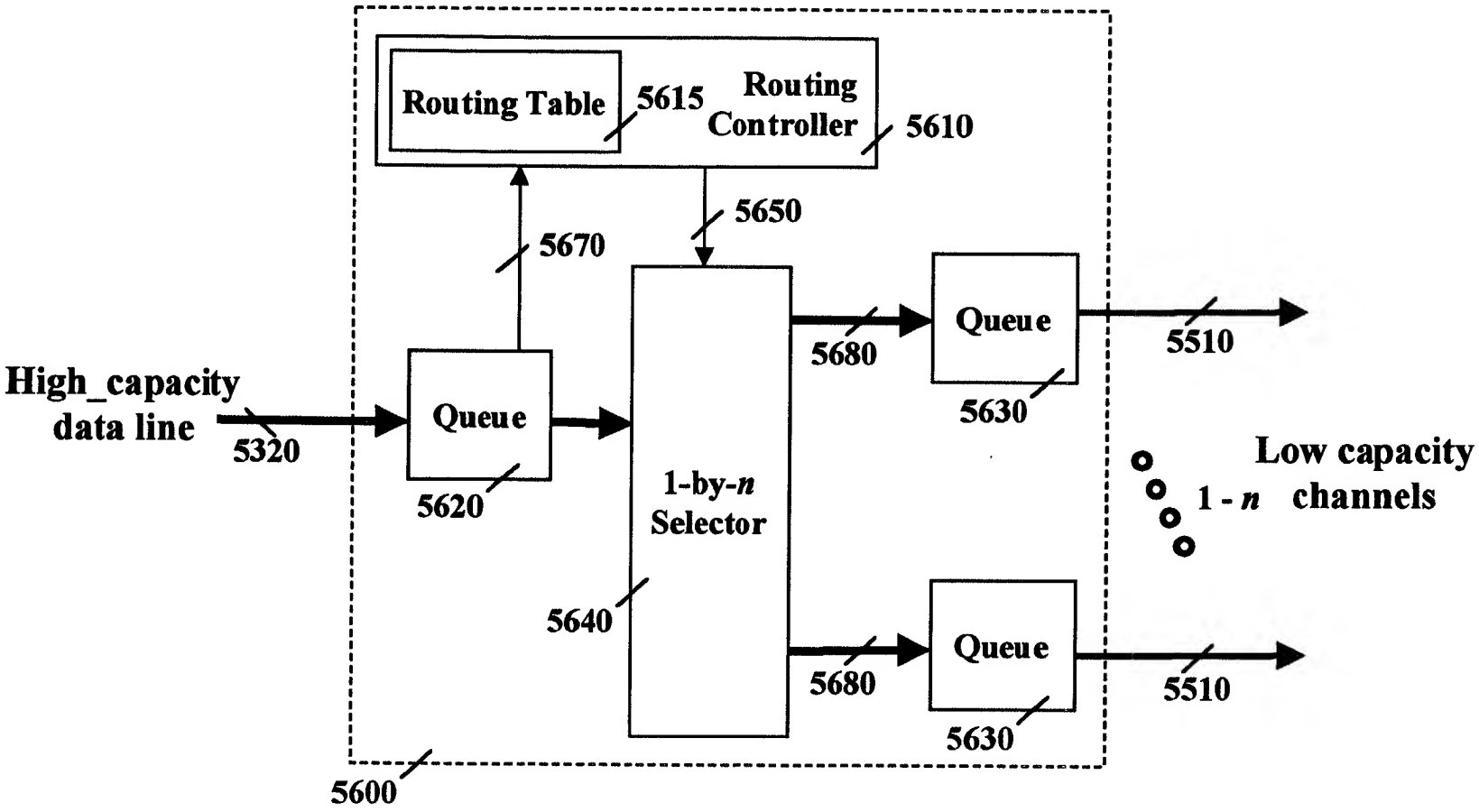


FIG. 51


Routing Table
5615
Routing Controller
5610
5650
5670
High_capacity data line
5320
Queue
5620
1-by-n Selector
5640
Queue
5680
5630
5510
Low capacity
1 - n channels
Queue
5680
5630
5510
5600

PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 52 OF 65

FIG. 52

- $CC1_length \cdot TF1 = CC2_length \cdot TF2 = CC3_length \cdot TF2$
- $TF2 = (SC1_length / SC2_length) \cdot TF1 = k \cdot TF1$, where the common cycles of *TF1* and *TF2* are aligned with respect to UTC.

For $k = 2$ and $c = 4$ (e.g., High_capacity=OC-192, Low_capacity=OC-48):

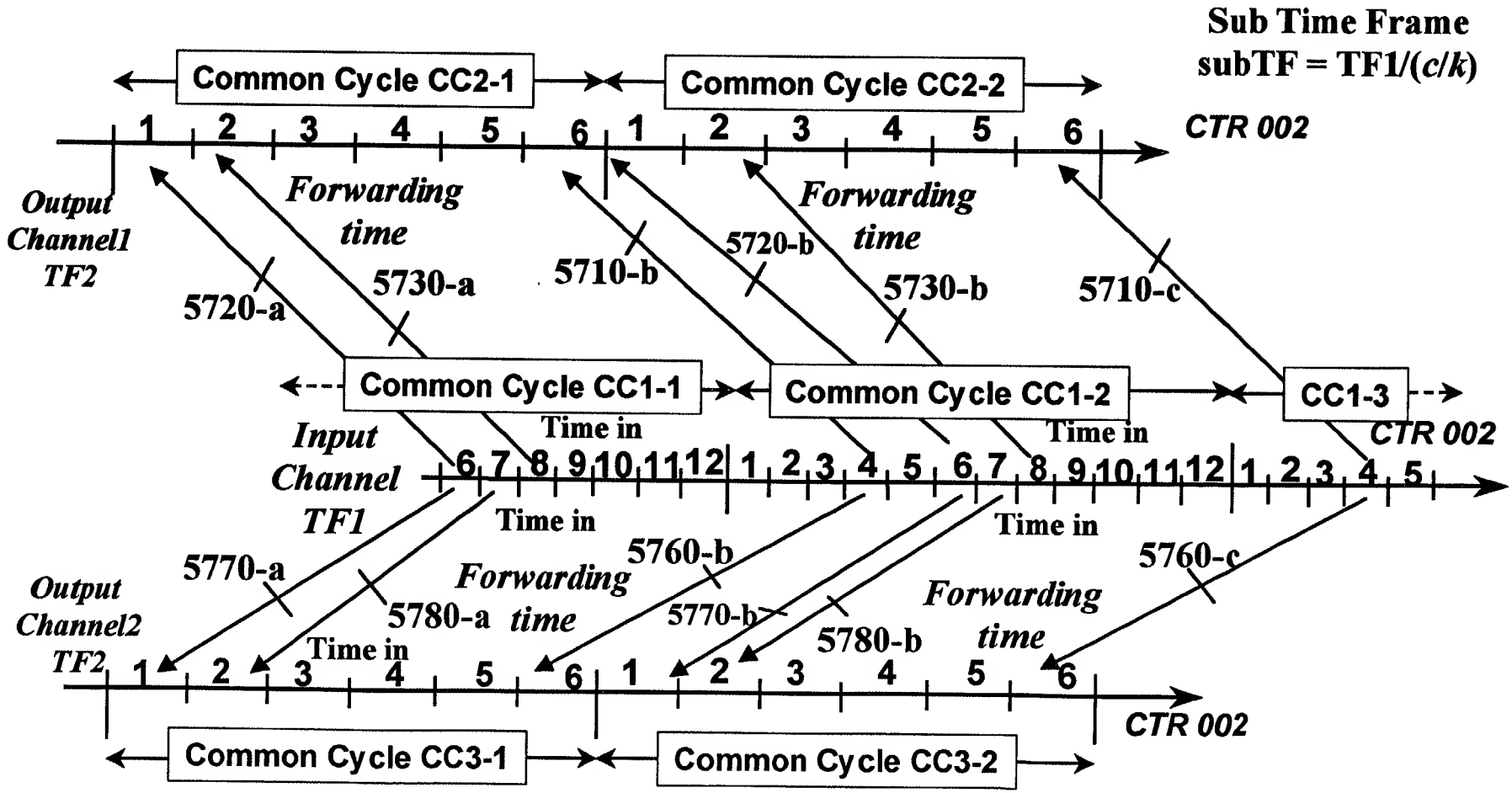


FIG. 53

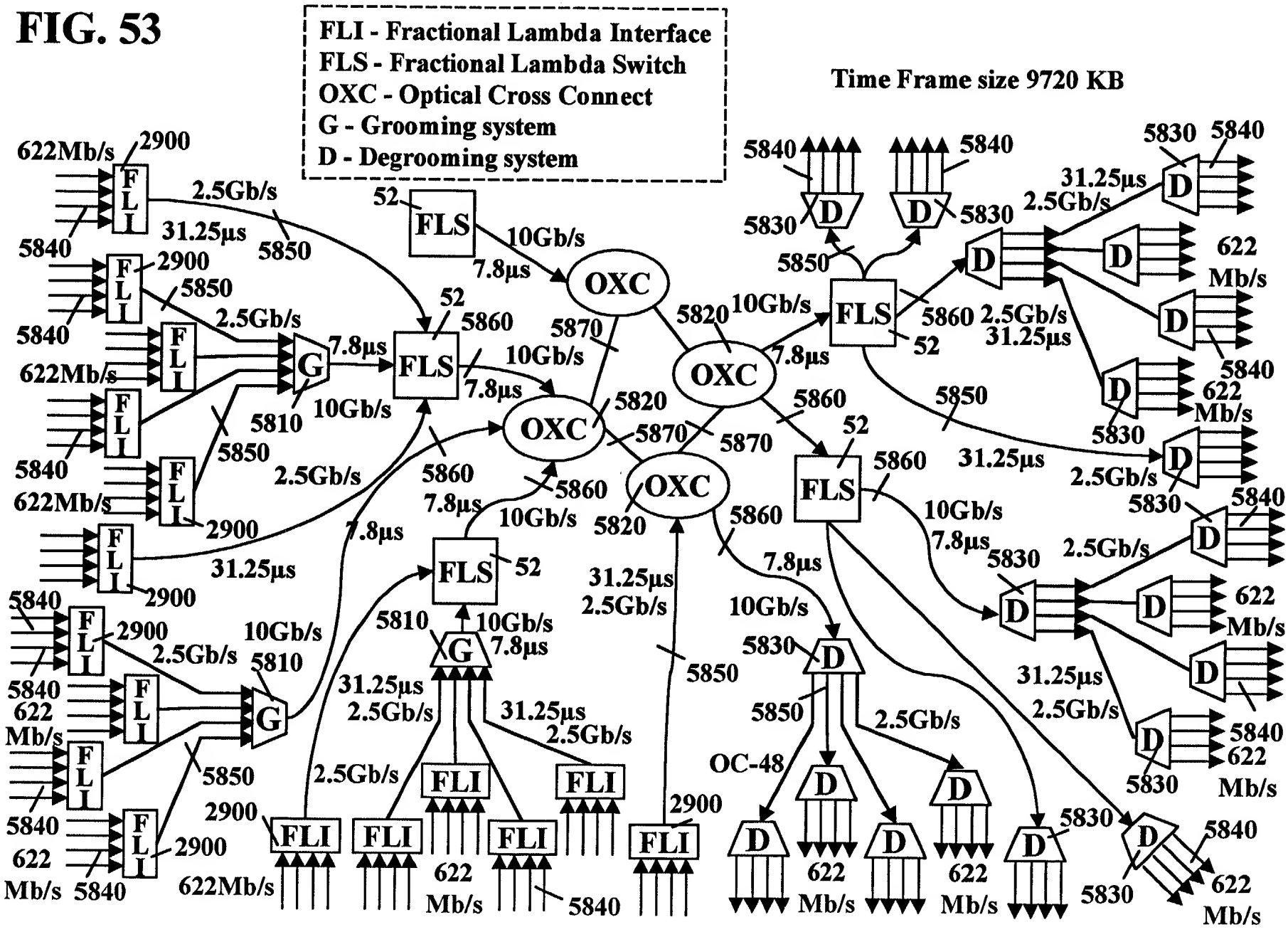

FLI - Fractional Lambda Interface
FLS - Fractional Lambda Switch
OXC - Optical Cross Connect
G - Grooming system
D - Degrooming system
Time Frame size 9720 KB
622Mb/s
2900
2.5Gb/s
31.25µs
5850
5840
52
FLS
10Gb/s
7.8µs
OXC
5870
5820
5860
5810
622
Mb/s
OC-48
FLI
G
D

FIG. 54

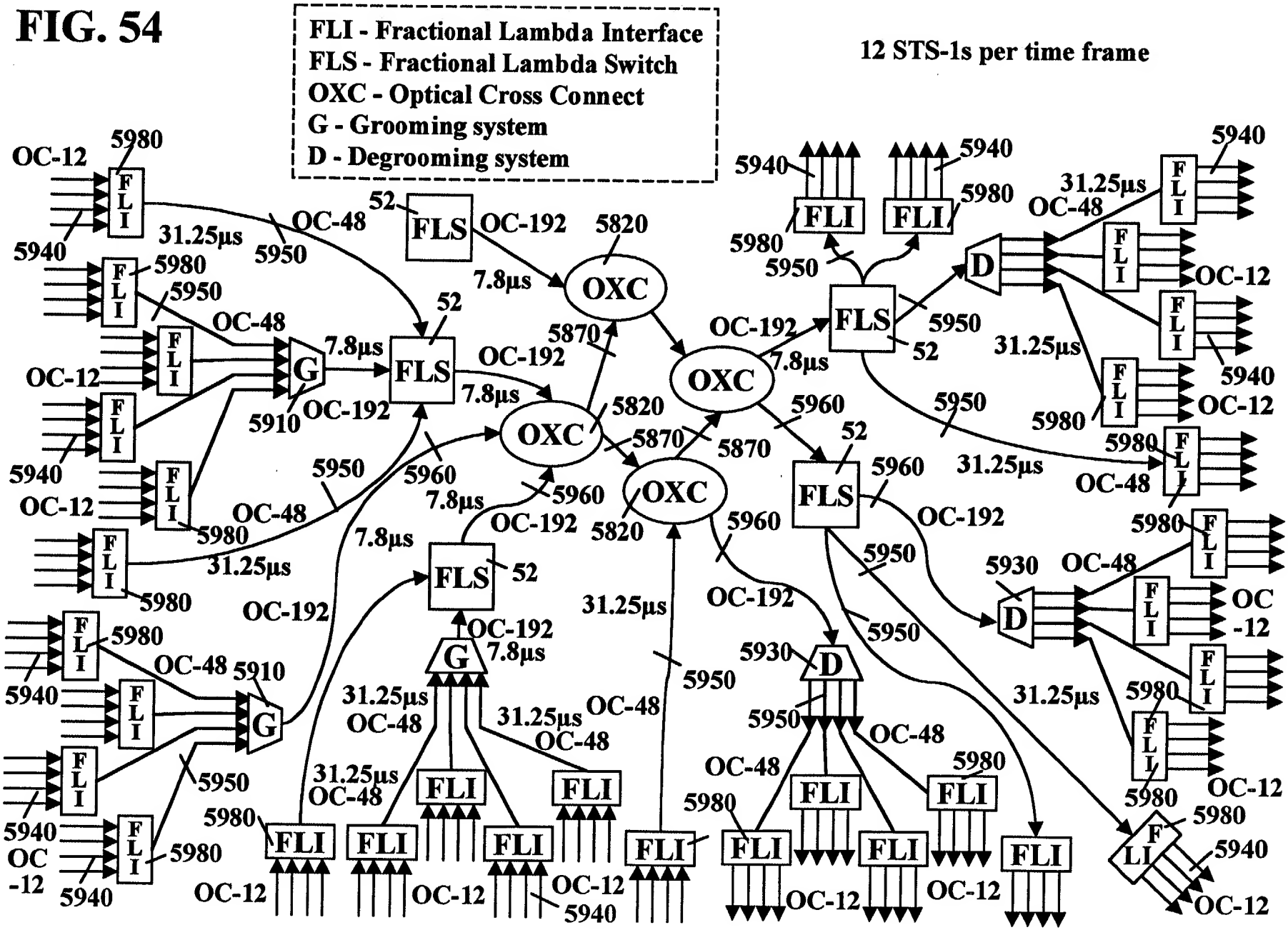

FLI - Fractional Lambda Interface
FLS - Fractional Lambda Switch
OXC - Optical Cross Connect
G - Grooming system
D - Degrooming system
12 STS-1s per time frame
OC-12
OC-48
OC-192
FLI
FLS
OXC
G
D
5980
5940
5950
5960
5910
5930
5820
5870
52
7.8µs
31.25µs

FIG. 55

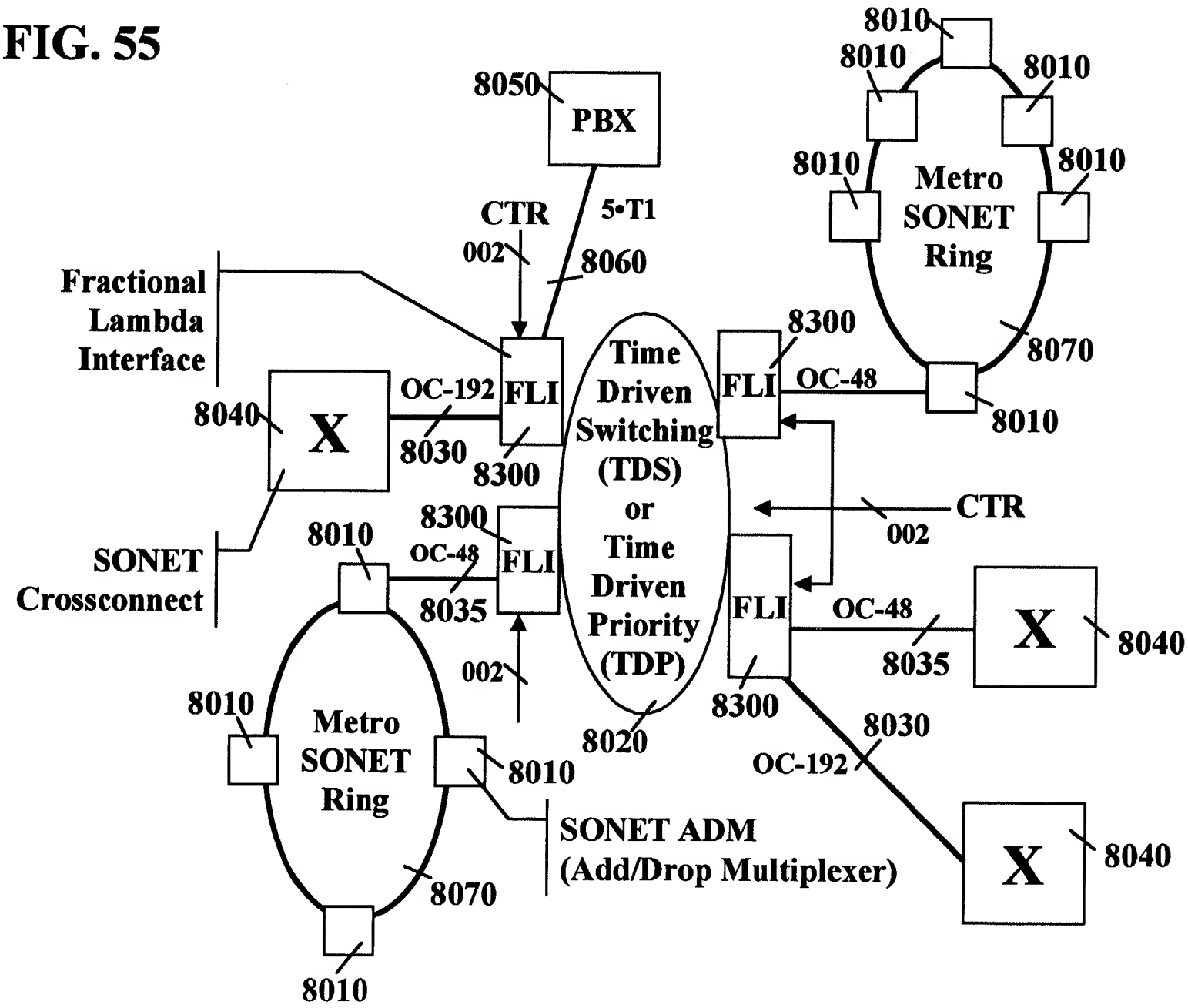

8050
PBX
5•T1
8060
CTR
002
Fractional
Lambda
Interface
8040
X
OC-192
8030
FLI
8300
Time
Driven
Switching
(TDS)
or
Time
Driven
Priority
(TDP)
8020
8300
FLI
OC-48
8010
8010
8010
8010
8010
Metro
SONET
Ring
8070
8010
8300
FLI
OC-48
CTR
002
SONET
Crossconnect
8010
8300
FLI
OC-48
8035
002
FLI
OC-48
8035
X
8040
8300
8030
OC-192
X
8040
8010
Metro
SONET
Ring
8010
SONET ADM
(Add/Drop Multiplexer)
8070
8010

FIG. 56

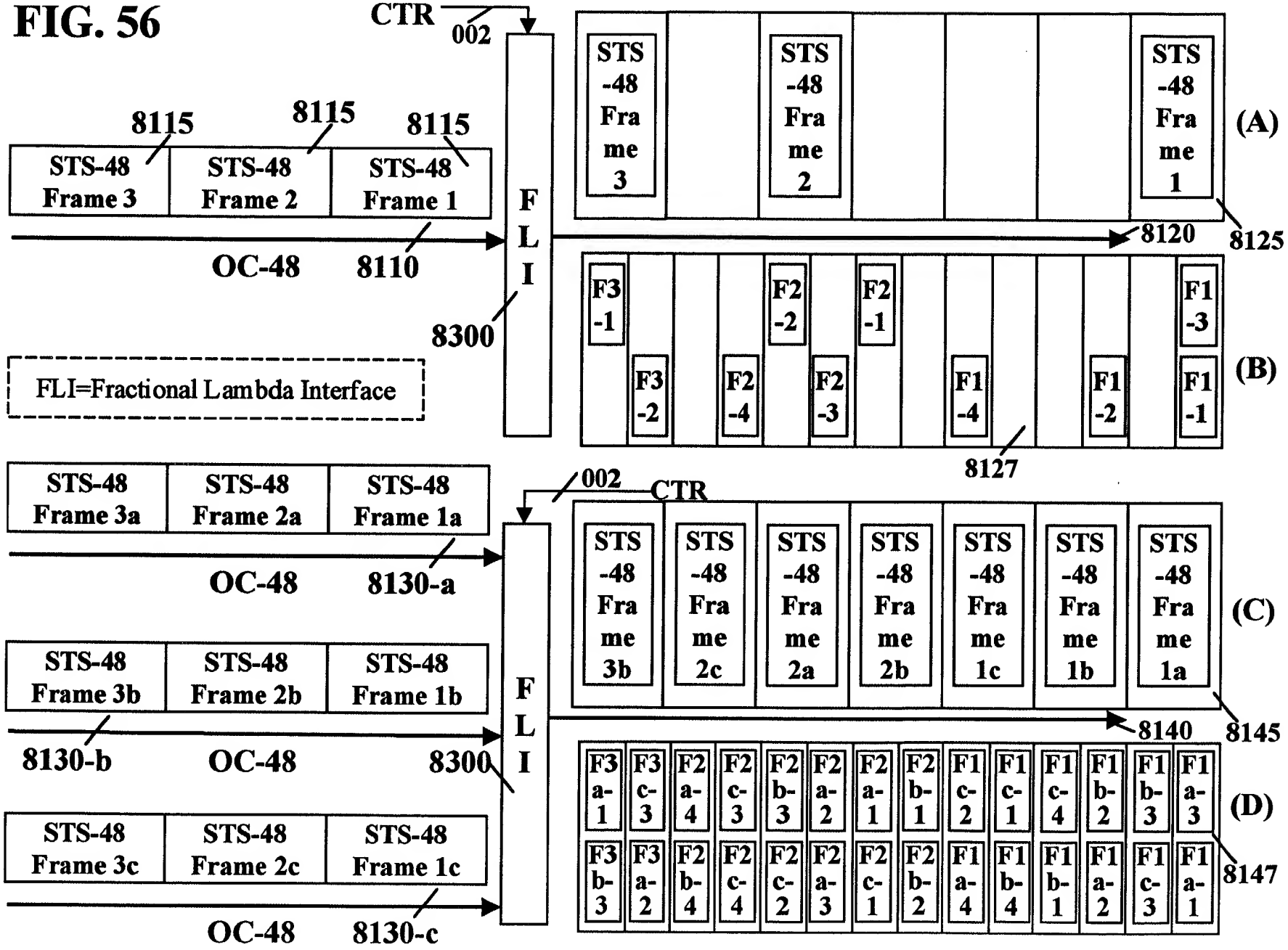

CTR
002
8115
8115
8115
STS-48 Frame 3
STS-48 Frame 2
STS-48 Frame 1
OC-48
8110
8300
FLI
FLI=Fractional Lambda Interface
STS-48 Frame 3
STS-48 Frame 2
STS-48 Frame 1
(A)
8120
8125
F3-1
F3-2
F2-4
F2-2
F2-3
F2-1
F1-4
F1-2
F1-3
F1-1
(B)
8127
STS-48 Frame 3a
STS-48 Frame 2a
STS-48 Frame 1a
OC-48
8130-a
STS-48 Frame 3b
STS-48 Frame 2b
STS-48 Frame 1b
8130-b
OC-48
8300
STS-48 Frame 3c
STS-48 Frame 2c
STS-48 Frame 1c
OC-48
8130-c
002
CTR
STS-48 Frame 3b
STS-48 Frame 2c
STS-48 Frame 2a
STS-48 Frame 2b
STS-48 Frame 1c
STS-48 Frame 1b
STS-48 Frame 1a
(C)
8140
8145
F3a-1
F3c-3
F2a-4
F2c-3
F2b-3
F2a-2
F2a-1
F2b-1
F1c-2
F1c-1
F1c-4
F1b-2
F1b-3
F1a-3
F3b-3
F3a-2
F2b-4
F2c-4
F2c-2
F2a-3
F2c-1
F2b-2
F1a-4
F1b-4
F1b-1
F1a-2
F1c-3
F1a-1
(D)
8147

FIG. 57

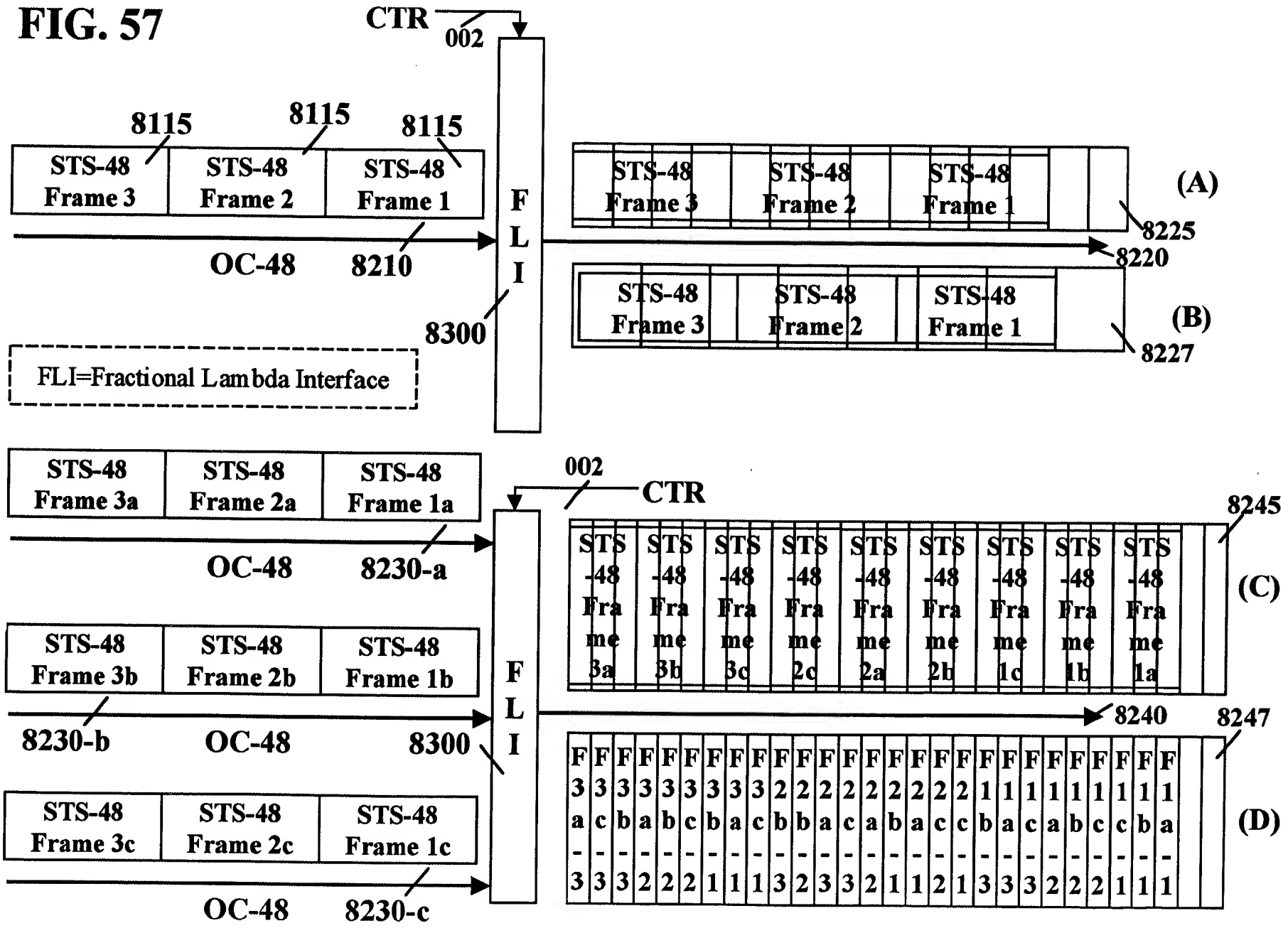
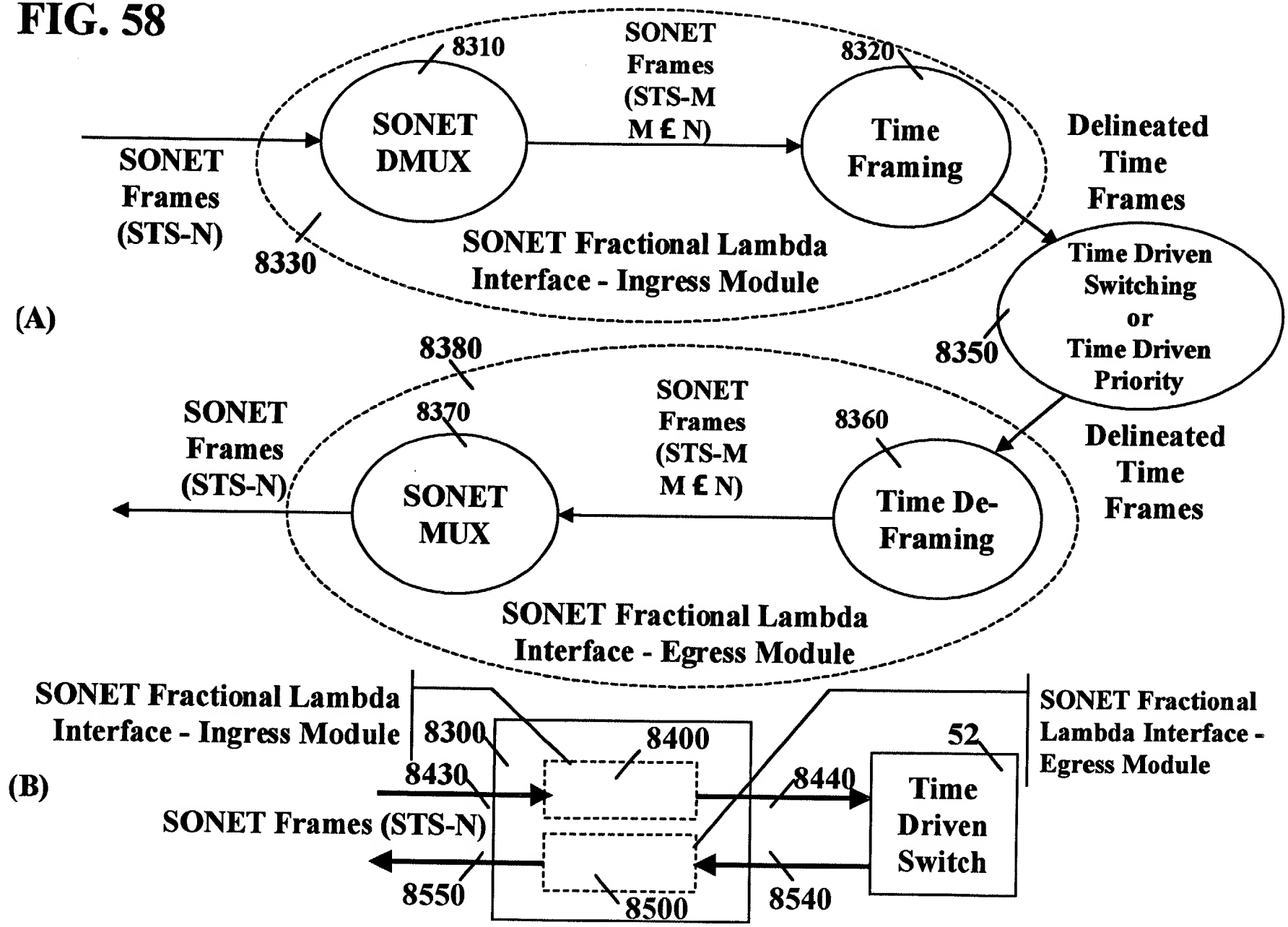

CTR
002
8115
8115
8115
STS-48 Frame 3
STS-48 Frame 2
STS-48 Frame 1
OC-48
8210
FLI
8300
FLI=Fractional Lambda Interface
STS-48 Frame 3
STS-48 Frame 2
STS-48 Frame 1
(A)
8225
8220
STS-48 Frame 3
STS-48 Frame 2
STS-48 Frame 1
(B)
8227
STS-48 Frame 3a
STS-48 Frame 2a
STS-48 Frame 1a
OC-48
8230-a
002
CTR
8245
STS-48 Frame 3a
STS-48 Frame 3b
STS-48 Frame 3c
STS-48 Frame 2c
STS-48 Frame 2a
STS-48 Frame 2b
STS-48 Frame 1c
STS-48 Frame 1b
STS-48 Frame 1a
(C)
STS-48 Frame 3b
STS-48 Frame 2b
STS-48 Frame 1b
8230-b
OC-48
8300
FLI
8240
8247
F3a-3
F3c-3
F3b-3
F3a-2
F3b-2
F3c-2
F3b-1
F3a-1
F3c-1
F2b-3
F2a-2
F2c-3
F2a-3
F2c-2
F2b-1
F2a-1
F2c-1
F1b-3
F1a-3
F1c-3
F1a-2
F1b-2
F1c-2
F1c-1
F1b-1
F1a-1
(D)
STS-48 Frame 3c
STS-48 Frame 2c
STS-48 Frame 1c
OC-48
8230-c

FIG. 58


(A)
SONET Frames (STS-N)
8310
SONET DMUX
SONET Frames (STS-M M £ N)
8320
Time Framing
Delineated Time Frames
8330
SONET Fractional Lambda Interface - Ingress Module
Time Driven Switching or Time Driven Priority
8350
8380
8370
SONET Frames (STS-N)
SONET MUX
SONET Frames (STS-M M £ N)
8360
Time De-Framing
Delineated Time Frames
SONET Fractional Lambda Interface - Egress Module
(B)
SONET Fractional Lambda Interface - Ingress Module
8300
8400
52
SONET Fractional Lambda Interface - Egress Module
8430
8440
SONET Frames (STS-N)
Time Driven Switch
8550
8500
8540

PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 59 OF 65

FIG. 59

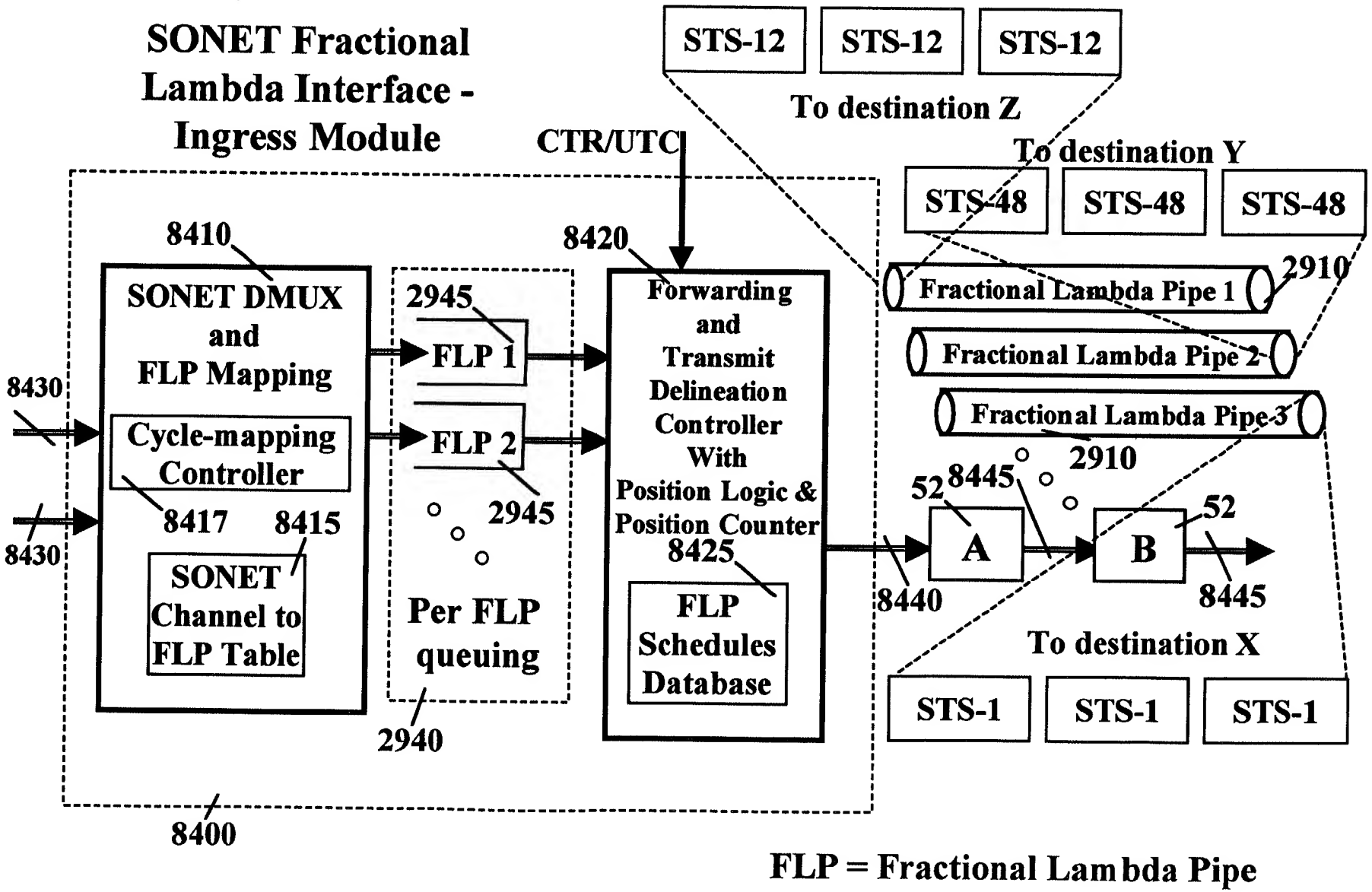
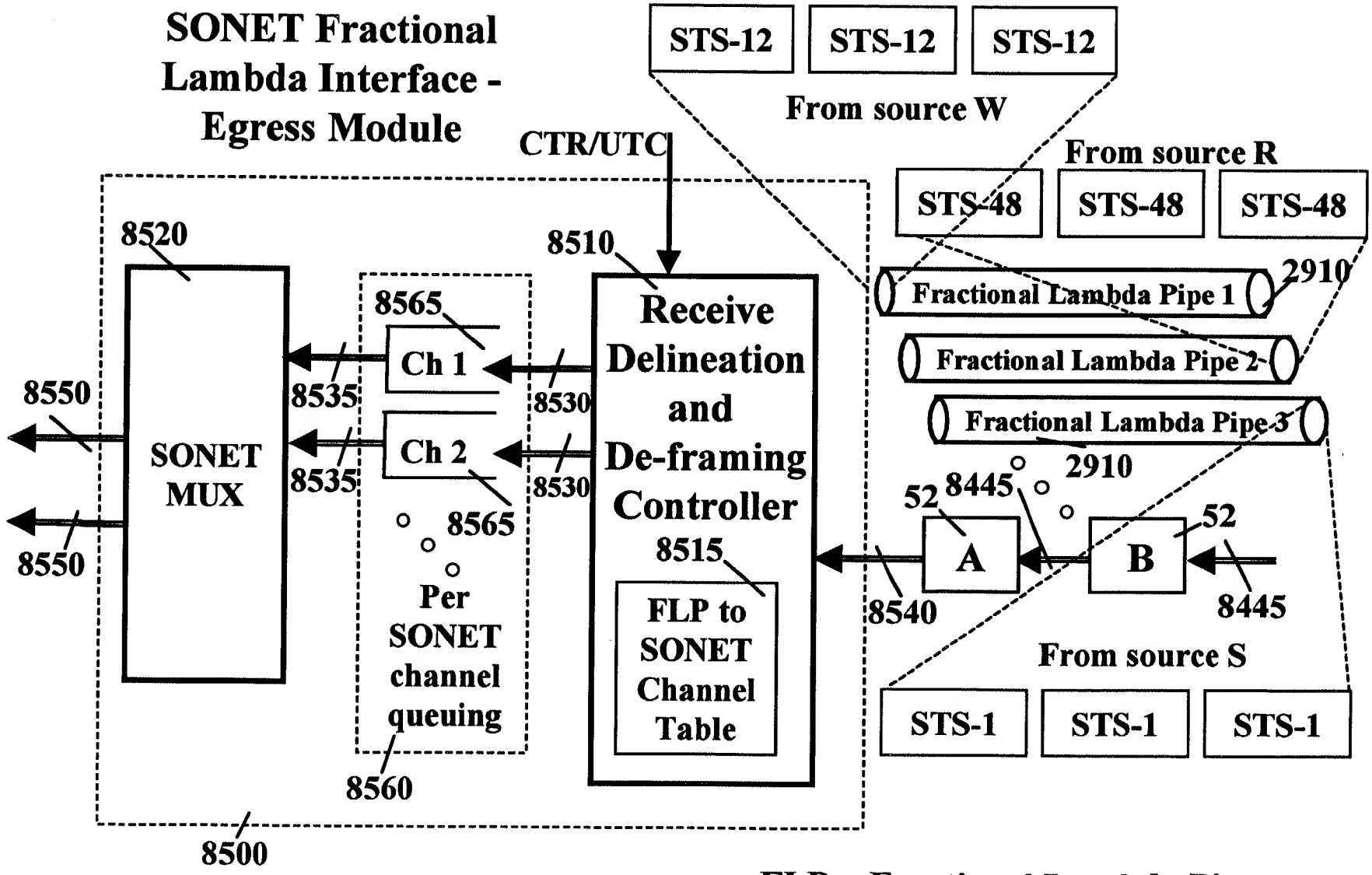


FIG. 60



PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 60 OF 65

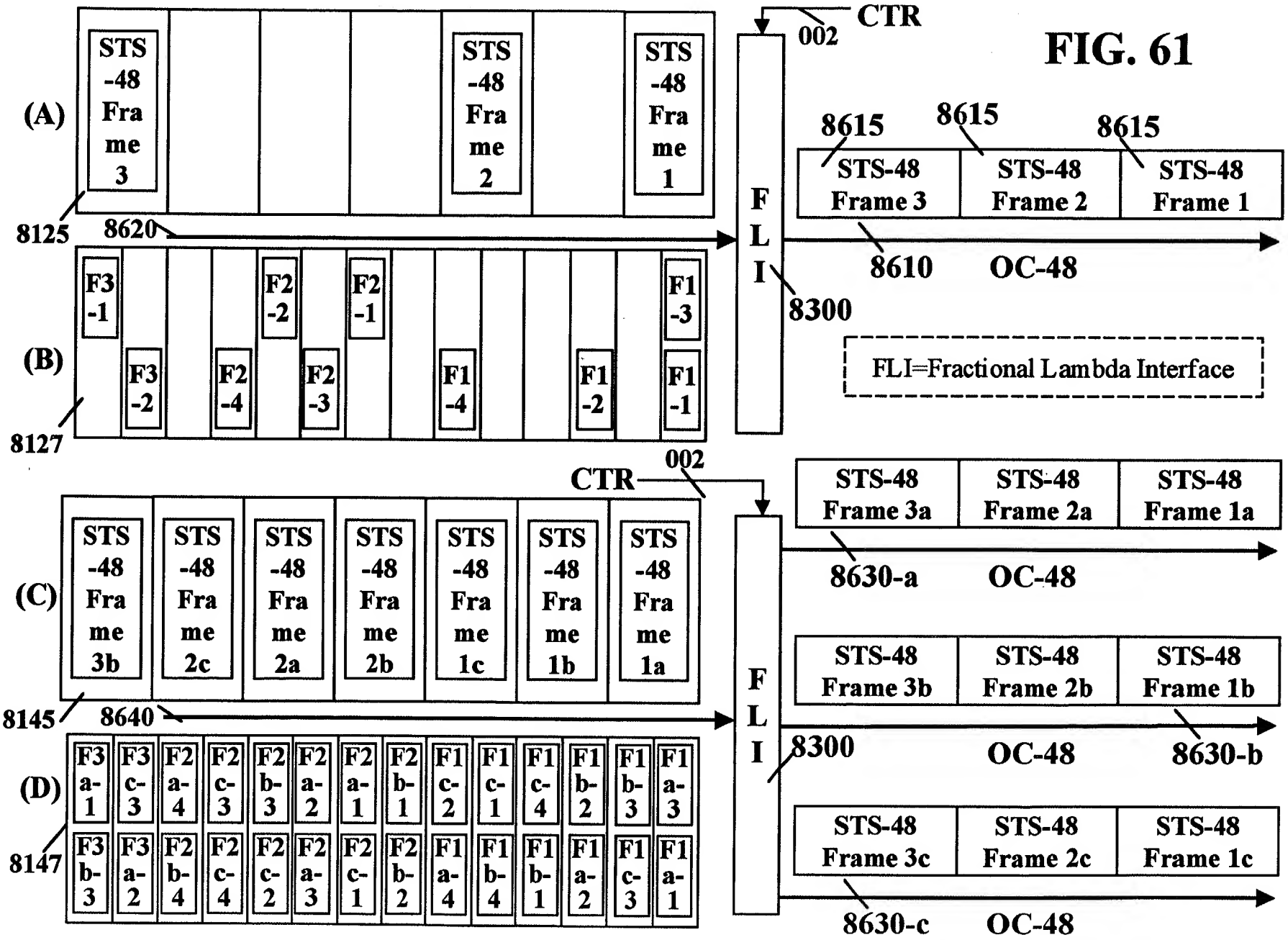
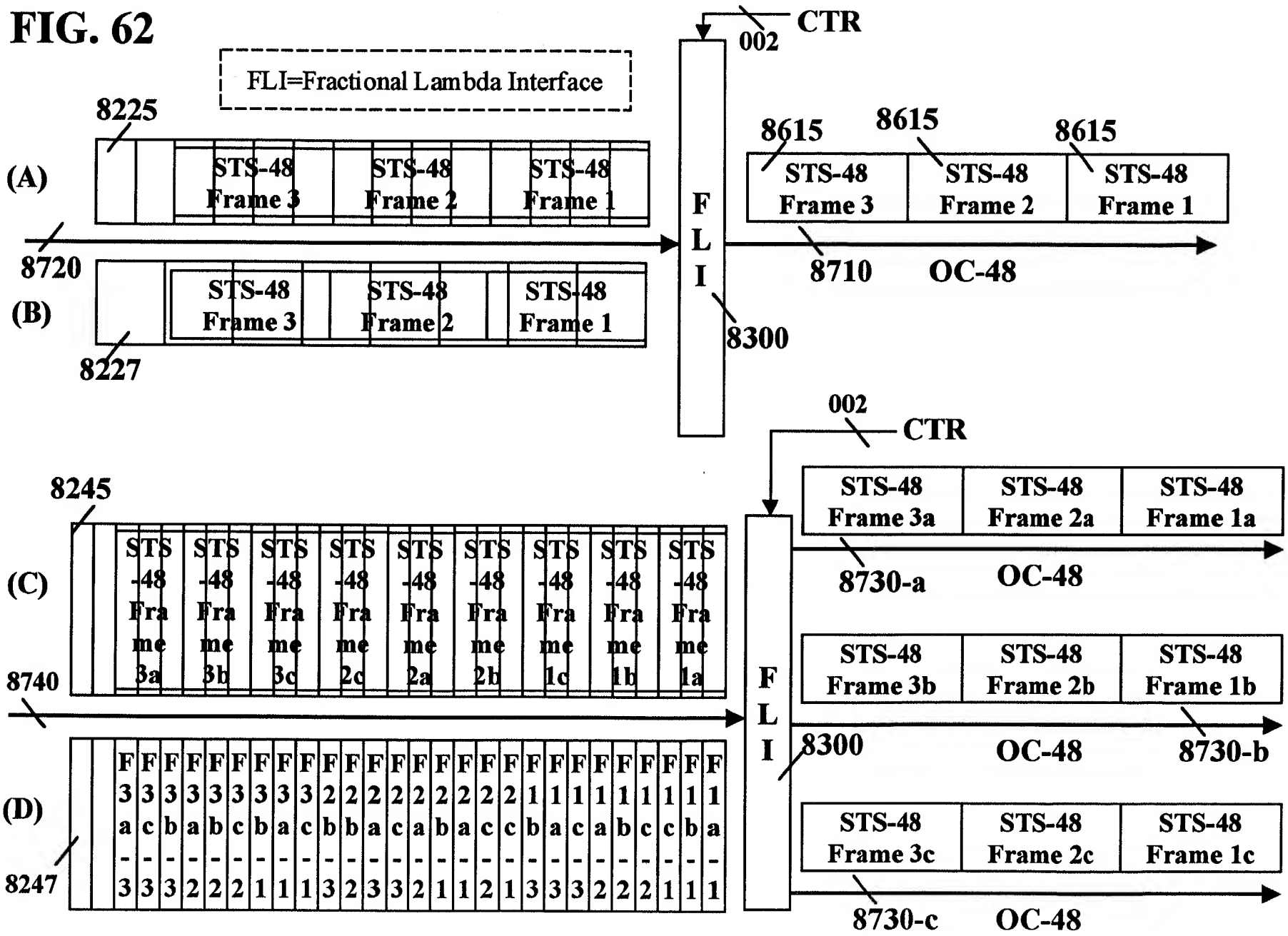

(A)
STS -48 Fra me 3
STS -48 Fra me 2
STS -48 Fra me 1
8125
8620
CTR
002
FLI
8615
8615
8615
STS-48 Frame 3
STS-48 Frame 2
STS-48 Frame 1
8610
OC-48
8300
(B)
F3 -1
F3 -2
F2 -4
F2 -2
F2 -3
F2 -1
F1 -4
F1 -2
F1 -3
F1 -1
8127
FLI=Fractional Lambda Interface
CTR
002
(C)
STS -48 Fra me 3b
STS -48 Fra me 2c
STS -48 Fra me 2a
STS -48 Fra me 2b
STS -48 Fra me 1c
STS -48 Fra me 1b
STS -48 Fra me 1a
8145
8640
STS-48 Frame 3a
STS-48 Frame 2a
STS-48 Frame 1a
8630-a
OC-48
STS-48 Frame 3b
STS-48 Frame 2b
STS-48 Frame 1b
8300
OC-48
8630-b
(D)
F3 a-1
F3 c-3
F2 a-4
F2 c-3
F2 b-3
F2 a-2
F2 a-1
F2 b-1
F1 c-2
F1 c-1
F1 c-4
F1 b-2
F1 b-3
F1 a-3
F3 b-3
F3 a-2
F2 b-4
F2 c-4
F2 c-2
F2 a-3
F2 c-1
F2 b-2
F1 a-4
F1 b-4
F1 b-1
F1 a-2
F1 c-3
F1 a-1
8147
STS-48 Frame 3c
STS-48 Frame 2c
STS-48 Frame 1c
8630-c
OC-48

FIG. 61

FIG. 62


FLI=Fractional Lambda Interface
CTR
002
8225
(A)
STS-48 Frame 3
STS-48 Frame 2
STS-48 Frame 1
8720
(B)
8227
F L I
8300
8615
8615
8615
8710
OC-48
8245
(C)
STS -48 Fra me 3a
STS -48 Fra me 3b
STS -48 Fra me 3c
STS -48 Fra me 2c
STS -48 Fra me 2a
STS -48 Fra me 2b
STS -48 Fra me 1c
STS -48 Fra me 1b
STS -48 Fra me 1a
8740
(D)
8247
F3a-3
F3c-3
F3b-3
F3a-2
F3b-2
F3c-2
F3b-1
F3a-1
F3c-1
F2b-3
F2b-2
F2a-3
F2c-3
F2a-2
F2b-1
F2a-1
F2c-2
F2c-1
F1b-3
F1a-3
F1c-3
F1a-2
F1b-2
F1c-2
F1c-1
F1b-1
F1a-1
002
CTR
STS-48 Frame 3a
STS-48 Frame 2a
STS-48 Frame 1a
8730-a
OC-48
STS-48 Frame 3b
STS-48 Frame 2b
STS-48 Frame 1b
8300
OC-48
8730-b
STS-48 Frame 3c
STS-48 Frame 2c
STS-48 Frame 1c
8730-c
OC-48

PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 63 OF 65

FIG. 63

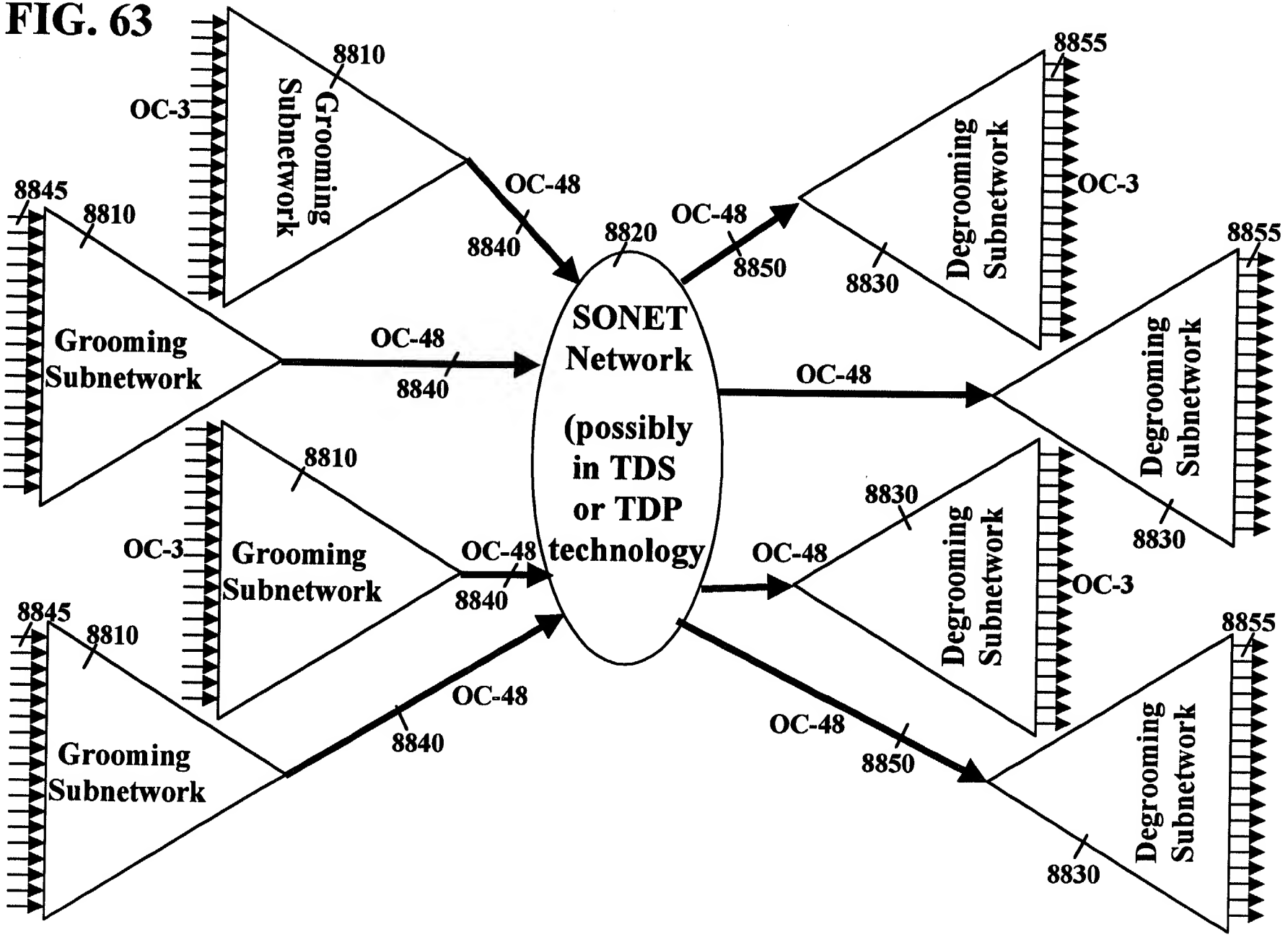
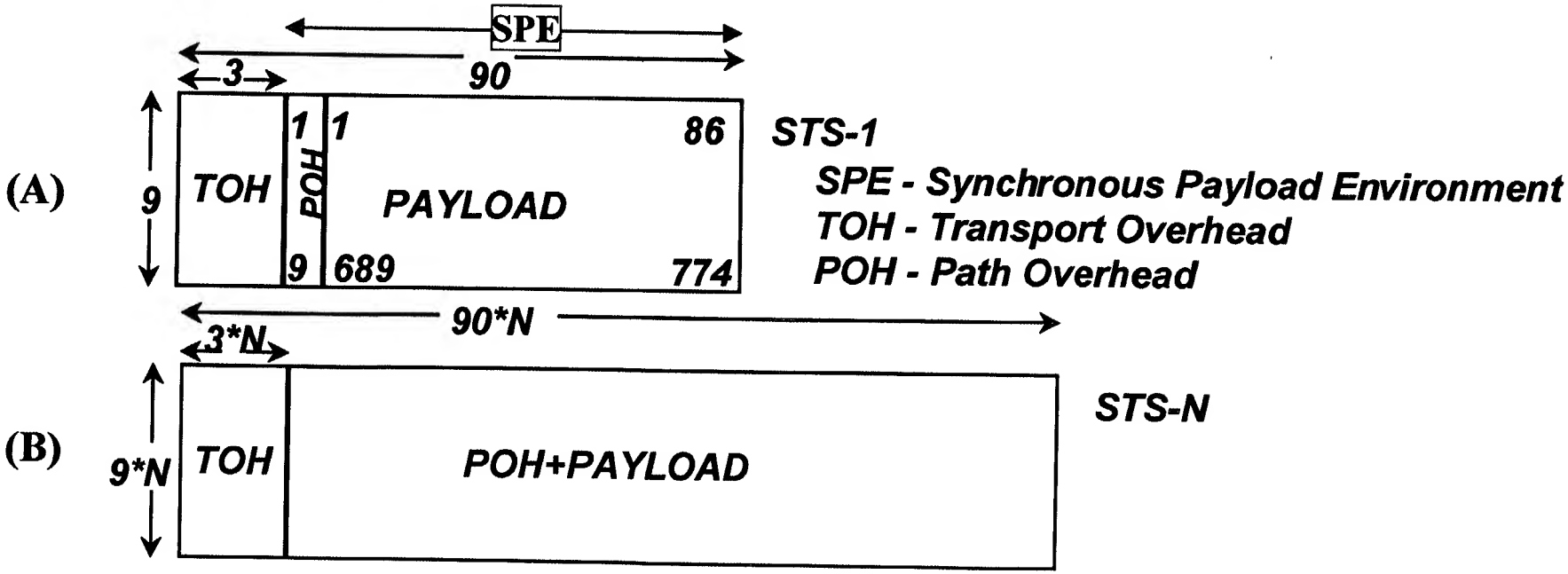


FIG. 64

- SONET - synchronous optical network
- Multiplexing method: byte interleaving
- Signal hierarchy: OC-N (STS-N)
  - STS-N rate: N*51.84 Mb/s
  - Frame format: 9 rows by 90*N columns
    - capacity: N*810 bytes in 125 microsecond.
    - overhead: N*27 bytes
    - payload: N*783 bytes



PATENT APPLICATION
OFEK ET AL.
ATTORNEY DOCKET NO.: SYN 1775
SHEET 65 OF 65

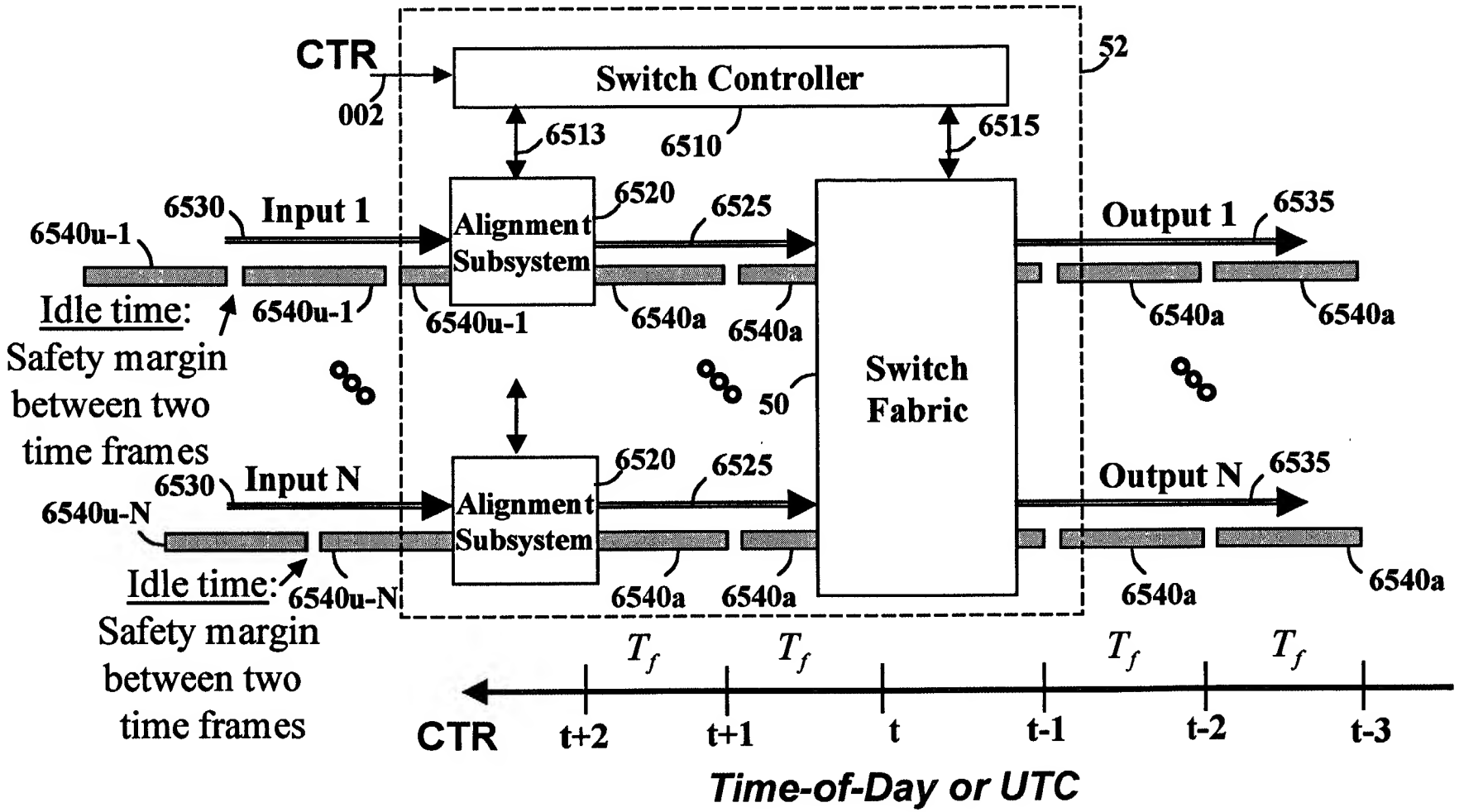



FIG. 65